

Updated Final System/Subsystem Specification (S/SS)

United States National Data Center (US NDC)

(Phase 2 Build 1)

**CONTRACT NO. F33657-99-C-4722
SAIC 01/3046 (REV -) CDRL B014**

15 January 2002

Prepared for:

ASC Det 3

1030 South Highway A1A
Patrick AFB, FL 32925-3002

Prepared by:



Science Applications International Corporation Monitoring Systems Operation

1227 S. Patrick Drive, Suite 110
Satellite Beach, FL 32937

Distribution authorized to US Government agencies only for administrative or operational use, 22 May 00. Other requests for this document shall be referred to Det 3 ASC, 1030 S. Highway A1A, Patrick AFB, FL 32925-3002.



Science Applications International Corporation
Monitoring Systems Operation

1227 S. Patrick Drive, Suite 110
Satellite Beach, FL 32937

Updated Final System/Subsystem Specification, US NDC (Phase 2), Revision -

Primary Author: S. Ingalls

Contributing Authors: D. Irons, C. Morency, H. Swanger, A. Henson, W. Nagy

Revision History

DATE	REVISION	DESCRIPTION	AUTHOR	APPROVED BY
27 Dec 00		Initial release, released as SAIC 01/3065, Version 1.0, before restructure	S. Ingalls	T. Ingalls
27 Feb 01		Final release, released as SAIC 01/3065, Version 1.1, before restructure	S. Ingalls	T. Ingalls
3 Aug 01	-	Draft release, released as SAIC 01/3065, before restructure	S. Ingalls	T. Ingalls
9 Nov 01	-	Final release, released as SAIC 01/3046, after restructure (see note)	S. Ingalls	T. Ingalls
15 Jan 02	-	Updated final, to include new requirements	S. Ingalls	T. Ingalls

Note: Future deliveries of SAIC-01/3065 will no longer be tracked in this document and will be tracked in the SAIC-01/3065 revision history only.

Table of Contents

1.	Scope	1
1.1	Identification.....	1
1.3	Document Overview	2
2.	Reference Documents.....	3
3.	Requirements	4
3.1	Required States and Modes	4
3.2	System Capability Requirements.....	4
3.2.1	Process Monitoring and Control.....	4
3.2.1.1	Process Control.....	4
3.2.1.2	Process Monitoring.....	5
3.2.2	Data Acquisition	5
3.2.2.1	Seismic, Hydroacoustic, Infrasonic, and Radionuclide Data Acquisition.....	5
3.2.2.2	Station Monitoring.....	6
3.2.2.3	Command, Control, and Calibration.....	7
3.2.2.4	Ancillary Data Acquisition	8
3.2.2.5	Data Acquisition Statistics.....	8
3.2.2.6	Data Acquisition Integrity	8
3.2.3	Data Forwarding and Transfer Integrity	9
3.2.3.1	Data Forwarding	9
3.2.3.2	Data Transfer Integrity	9
3.2.4	Processing Pipelines	10
3.2.4.1	Global Pipeline	10
3.2.4.2	Spotlight Pipeline	11
3.2.4.3	Forward Pipeline.....	11
3.2.4.4	Backward Pipeline	12
3.2.5	Detection Processing	13
3.2.5.1	Seismic Detection Processing.....	13
3.2.5.2	Hydroacoustic Detection Processing	13
3.2.5.3	Detection Processing Configuration.....	14
3.2.5.4	Data Quality Control	14
3.2.5.5	Detection.....	15
3.2.5.5.1	Beamforming during Detection	15
3.2.5.5.2	Filtering	15
3.2.5.5.3	Detectors	15
3.2.5.5.4	Detection Thresholds	16
3.2.5.5.5	Redundant Detections	16
3.2.5.5.6	Detection Loading	16

3.2.5.6	Seismic Signal Feature Measurement.....	16
3.2.5.6.1	Amplitude	17
3.2.5.7	Hydroacoustic Signal Feature Measurement.....	17
3.2.5.8	Post-detection Beamforming	17
3.2.5.9	Storage of Results	17
3.2.6	Phase Identification and Event Formation.....	17
3.2.6.1	General Capabilities	18
3.2.6.2	Phase Identification	18
3.2.6.3	Automatic Association	18
3.2.6.4	Automatic Event Location.....	19
3.2.6.5	Automatic Event Magnitude.....	20
3.2.6.6	Storage of Results	20
3.2.7	Event Identification	21
3.2.8	Tuning Support Tools.....	21
3.2.9	Analysis	22
3.2.9.1	General Capabilities for Analysis.....	22
3.2.9.2	Analysis Preprocessing.....	23
3.2.9.3	Interactive Event Refinement	23
3.2.9.4	Interactive Data Processing Support.....	24
3.2.9.5	Analysis of Discrimination Results	25
3.2.9.6	Use of Geographical Information	26
3.2.10	Generation of Bulletin Products	26
3.2.11	Data Processing Performance Monitoring.....	27
3.2.12	Training System Capabilities.....	30
3.2.12.1	Training System General Capabilities.....	30
3.2.12.2	Training System Process Control	31
3.2.13	Training System Data Preparation.....	31
3.2.14	US NDC Phase 2 Build 1 Compatibility with US NDC Phase 1 Capabilities	31
3.3	System External Interface Requirements	32
3.3.1	Interface Identification and Diagrams	33
3.3.1.1	Unclassified Interface Identification and Diagrams	33
3.3.1.2	Classified Interface Identification and Diagrams	33
3.3.2	External Interfaces.....	33
3.3.2.1	Unclassified External Interfaces.....	33
3.3.2.1.1	USNDC_AFTAC_UBBN	33
3.3.2.2	Classified External Interfaces	34
3.3.2.2.1	USNDC_AFTAC_CBBN.....	34
3.3.2.2.2	USNDC_ADSNARCH.....	34
3.3.2.2.3	USNDC_AFTAC_HYDRO	34
3.3.2.3	Training System External Interfaces	35

3.3.3	Interface Protocols	35
3.4	System Internal Interface Requirements.....	35
3.4.1	Interface Identification and Diagrams	35
3.4.1.1	Unclassified Interface Identification and Diagrams	35
3.4.1.2	Classified Interface Identification and Diagrams	36
3.4.2	Internal Interfaces	36
3.4.2.1	Unclassified Internal Interfaces	36
3.4.2.2	Classified Internal Interfaces	36
3.4.2.2.1	USNDC_CTS	36
3.4.2.3	US NDC Training System Internal Interfaces	36
3.4.2.3.1	Process Control Interface.....	36
3.4.2.3.2	Data Preparation Interface	36
3.4.2.3.3	Data Account Interface	37
3.4.3	Interface Protocols	37
3.5	System Internal Data Requirements	37
3.5.1	Backup and Restore Functionality.....	37
3.5.1.1	Backup Functionality.....	38
3.5.1.2	Restore Functionality.....	38
3.5.2	Internal data formats	38
3.6	Adaptation Requirements	38
3.7	Safety requirements	38
3.7.1	Toxic Products and Hazardous Materials	38
3.7.2	Volatile Organic Compounds (VOCs)	38
3.8	Security and Privacy Requirements.....	39
3.8.1	Security Procedures	39
3.8.2	Security Architecture	39
3.9	System Environment Requirements	41
3.9.1	Operating Environment	41
3.9.2	Orderly Shutdown and Restart	42
3.9.3	Protection of Hardware.....	42
3.10	Computer Resource Requirements	42
3.10.1	Computer Hardware Requirements	42
3.10.1.1	Training System Computer Hardware Requirements.....	42
3.10.2	Computer Hardware Resource Utilization Requirements	43
3.10.2.1	Data Storage Requirements	43
3.10.2.1.1	On-line Storage.....	43
3.10.2.1.1.1	Short-term Storage.....	43
3.10.2.1.1.2	Long-term Storage	44
3.10.2.1.2	Off-line Storage	44
3.10.2.1.3	Buffered Storage.....	45
3.10.2.1.4	Physical Data Storage	45

3.10.2.2	Database Storage	45
3.10.2.3	Training System Computer Hardware Resource Utilization Requirements	45
3.10.3	Computer Software Requirements.....	46
3.10.3.1	General Software	46
3.10.3.2	User Interface	46
3.10.3.3	Database.....	47
3.10.3.4	Distributed Processing	48
3.10.3.5	Training System Computer Software Requirements	48
3.10.4	Computer Communications Requirements	48
3.11	System Quality Factors.....	48
3.11.1	Reliability	49
3.11.2	Maintainability.....	49
3.11.3	Availability	51
3.12.4	Training System Quality Requirements	51
3.12	Design and Construction Constraints	52
3.13	Personnel-related Requirements	52
3.14	Training-related Requirements	52
3.15	Logistics-related Requirements	52
3.16	Other Requirements	53
3.17	Packaging Requirements	53
3.18	Precedence and Criticality of Requirements	53
4.	Qualification Provisions	54
5.	Requirements Traceability.....	83
6.	Notes	127
6.1	GFE Products.....	127
Appendix A.	Appendix A. Acronyms and Definitions	A-1

List of Tables

Table 1.	Build 1 US NDC Data Acquisition Capacities	6
Table 2.	Unclassified External Interface Identification	33
Table 3.	Classified External Interface Identification	33
Table 4.	Classified Internal Interface Identification	36
Table 5.	Qualification Method	54
Table 6.	Requirements Traceability	83
Table 7.	Higher-Level Traceability.....	116

1. Scope

1.1 Identification

This System/Subsystem Specification (SSS) defines the system requirements for the United States National Data Center (US NDC) Phase 2 Build 1 system. The US NDC Operational System is located at the Air Force Technical Applications Center (AFTAC) at Patrick Air Force Base (PAFB), Florida (FL); the US NDC Training System is located at Goodfellow AFB (GAFB), Texas (TX).

1.2 System Overview

The US NDC Phase 2 Build 1 system acquires, processes and interprets data necessary to meet the U.S. nuclear monitoring needs. The US NDC Phase 2 Build 1 system will replace the existing Phase 1 Upgrade System at PAFB in 2002.

The capabilities of the US NDC Phase 2 system are driven by Presidential Decision Directive 18, which defines the desired monitoring capabilities for the United States. The specifications in this document were derived from the original US NDC Phase 2 System Requirements Document (SRD), which has been replaced by a more generic SRD. The important improvements to the existing monitoring system provided in Phase 2 Build 1 are as follows:

- Upgraded system infrastructure
 - ▲ The US NDC Phase 1 process control uses commercial off-the-shelf (COTS) software that is no longer supported by the vendor. This software will be replaced in Phase 2 Build 1
 - ▲ The database schema will be upgraded to support new data types and capabilities
 - ▲ The operating system will be upgraded to the latest approved version
 - ▲ The US NDC Oracle database will be upgraded to the latest approved version
 - ▲ The Build 1 software baseline will consist of the US NDC Phase 1 Upgrade baseline merged with the International Data Centre (IDC) Release 3 baseline
- Integrated teleseismic and regional processing
 - ▲ Teleseismic and broad area regional processing will be integrated in the global pipeline
- Expansion of auxiliary pipelines
 - ▲ New Spotlight regions will be added as provided by Government-furnished equipment (GFE)
- Tuning of processing pipelines
 - ▲ Studies will be performed to optimize performance of the processing pipelines

- New stations
 - ▲ The system will support continued growth of data sources
- Expanded use of the Department of Energy (DoE) Knowledge Base
 - ▲ Travel-time corrections will be updated for seismic data. New and updated Geographical Information System (GIS) products will be available for detailed analysis
- New signal processing capabilities
 - ▲ New data processing capabilities will be added, including long-period signal detection
- Field-site monitoring graphical user interface (GUI)
 - ▲ New field site interfaces, provided as third party software, will monitor all data acquisition supporting site command and control
- Training System
 - ▲ The Training System will be enhanced to include new features added to the operational system during Phase 2

1.3 Document Overview

This document is prepared in accordance with (IAW) Data Item Description (DID) DI-IPSC-81431 for an S/SS. Section 1.0 provides the scope of the US NDC Phase 2 Build 1 system and this document. Section 2.0 provides a list of referenced documents. Section 3.0 provides detailed requirements for the system. Section 4.0 describes the requirements' qualification provisions. Section 5.0 describes the requirements' traceability from SRD requirements to SSS specifications and the higher-level requirements' traceability from the SRD requirements in Appendix C to the SSS specifications. Section 6.0 is the Notes section describing the GFE products. Appendix A contains a list of acronyms used in this document.

2. Reference Documents

Air Force Manual 33-229, Controlled Access Protection (CAP) for IS Systems, 1 November 1997

Reference 11, Event Classification Procedures for the Seismic Technique, 5 April 1982

System Requirements Document (SRD) for the United States National Data Center (Phase 2), Document Number 1001901, 7 September 2001.

System Requirements Document (SRD) for the United States National Data Center (Phase 2), Revision 0, Document Number 1002348, 2 July 2001

Statement of Work (SOW) for the United States National Data Center (Phase 2), Version E, Document Number 1001902, 26 April 2001

PDD-18, Presidential Decision Directive 18, 20 December 1993

Network Definition Document (NDDOC) for the United States National Data Center (Phase 2), April 2001

Data Item Description (DID), DD Form 1664, Identification Number DI-IPSC-81431, 5 December 1994

Interface Requirements Specification (IRS) for the United States National Data Center (Phase 2), (In work)

Interface Control Document (ICD) for the United States National Data Center (Phase 2), Version 2.0, SAIC-00/3042, 16 February 2001

Program Parts List (PPL) for the United States National Data Center (Phase 2), (In work)

3. Requirements

3.1 Required States and Modes

The US NDC will consist of an operational system located at PAFB, FL, and a training system located at GAFB, TX. These systems will operate two distinct states in parallel. The capabilities for the primary operational mission will be satisfied by the operational system that must support continuous, 7 days per week/24 hours per day operation. The capabilities for training analysts to use the operational system will be satisfied by the training system, which will support normal, 5 days per week/8 hours per day operation on an as-needed basis.

3.2 System Capability Requirements

The US NDC operational system will consist of an Unclassified Subsystem and a Classified Subsystem. The Training System, although physically located in a different location, will be considered a subsystem of the US NDC because the majority of its capabilities must be met by the use of the operational system's software and processes.

This section is separated into categories describing the functional requirements for the capabilities required of the US NDC. Requirements that apply only to one of the subsystems are specified as such. Requirements that apply to the entire US NDC Phase 2 Build 1 system do not make this distinction. Each of the following subsections includes an introductory overview of the system capabilities attributed to that subsection unless the capabilities needed no explanation.

An attempt was made to distinguish between requirements stating a US NDC function and requirements that provide users a capability to perform those functions.

3.2.1 Process Monitoring and Control

3.2.1.1 Process Control

P2SSS522 The US NDC shall provide interactive functionality to automatically execute data acquisition, data processing and data storage functions.

P2SSS2 The US NDC shall provide interactive functionality to execute all automated data acquisition, data processing, and data storage functions.

P2SSS3 The US NDC shall provide functionality to initiate and interrupt all automated processing tasks on the system from a controlled interface.

P2SSS4 The US NDC shall be able to automatically initiate processing based on configurable criteria including, as a minimum, time, availability of data, and completion of prior processing steps.

P2SSS5 The US NDC shall control sequencing of multiple processes so dependent processes are executed in sequential or parallel paths.

P2SSS6 The US NDC shall provide configurable sequencing for processes, and shall support rule-based processing of sequential tasks such that the success or failure of one task can initiate another task.

3.2.1.2 Process Monitoring

P2SSS7 The US NDC shall provide status for all automated processes.

P2SSS8 The US NDC shall provide logging for all automated processes.

P2SSS9 The US NDC shall provide a common interface for the review of all logs.

P2SSS10 The US NDC shall provide functionality to automatically and immediately notify users at the System Operations Manager (SOM) and Data Acquisition Manager (DAM) consoles of the failure of any individual process.

3.2.2 Data Acquisition

The US NDC acquires waveform data from seismic, hydroacoustic, and infrasonic field stations. All data are acquired at the US NDC through the AFTAC Network. Data formats vary between station types and are converted according to Continuous Data (CD)-1.1 conventions.

3.2.2.1 Seismic, Hydroacoustic, Infrasonic, and Radionuclide Data Acquisition

Table 1 contains the maximum amount of data that US NDC Phase 2 Build 1 is expected to acquire. This information is based on the *Network Definition Document (NDDOC) for the United States National Data Center (Phase 2)*, dated April 2001, Appendices A through D, for stations acquired through the year 2003. The table presents a total for individual station types, and the total gigabytes (GB) per day. Acquired critical/continuous, supplementary continuous, and supplementary on request seismic waveform data are comprised of 797, 331, and 156 channels respectively. All are assumed to be sampled at 40 samples per second, which accounts for the maximum samples acquired per station. Acquired hydroacoustic waveform data are comprised of 59 channels sampled at an average of 250 samples per second. Infrasonic waveform data acquired are comprised of 179 channels sampled at an average of 40 samples per second. Radionuclide data are acquired from 11 locations. All techniques are assumed to have 24 bits per sample. Table 1 summarizes these capacities.

Table 1. Build 1 US NDC Data Acquisition Capacities

STATION NETWORK	CHANNELS	TOTAL (GBYTES/DAY)
Critical/continuous seismic	797	7.2
Supplementary continuous seismic	331	4.2
Supplementary on request seismic	156	1.8
Hydroacoustic	59	3.6
Infrasound	179	0.61
Radionuclide	11 Locations	0.50
Totals	1522 Channels	17.9 +3.58 [20 percent (%) CD1.1 overhead] 21.48 GB/day

P2SSS11 The US NDC shall acquire waveform data in the format outlined in section 3.3.2 of this document.

P2SSS12 The US NDC shall automatically acquire unprocessed waveform data at the capacity characterized in Table 1.

P2SSS13 The US NDC shall acquire and validate authenticated data using SDAS OMS software. (Deferred).

P2SSS500 The US NDC shall have the capability to automatically acquire up to 200 Mbytes of radionuclide sensor data in a 24-hour period.

P2SSS513 In the event of an outage (communications, DAS, diode, or CAS), the US NDC shall acquire waveform data at no less than a 2:1 (data duration/elapsed time) ratio rate. (Depending on its capacity, a station might send 12 hours of near-realtime data while simultaneously sending 12 hours of older data).

3.2.2.2 Station Monitoring

The US NDC will provide capabilities associated with station monitoring. These functions will be provided as by GFE.

P2SSS14 The US NDC shall monitor remote field stations.

P2SSS15 The US NDC shall provide a continuous display of all seismic, hydroacoustic, and infrasonic station and sensor status.

P2SSS16 The US NDC shall provide a GUI to continuously display unprocessed waveforms.

P2SSS17 The US NDC shall provide a GUI to continuously monitor communications between the US NDC and external sites.

P2SSS18 The US NDC shall provide a GUI to continuously monitor remote seismic, hydroacoustic and infrasonic field sensors and digitizers.

P2SSS19 The US NDC shall provide a GUI to continuously monitor radionuclide stations.

P2SSS537 The US NDC shall incorporate web-based event bulletin software. (Deferred)

3.2.2.3 Command, Control, and Calibration

The US NDC will provide capabilities associated with station command, control, and calibration. These functions will be provided as GFE products.

P2SSS20 The US NDC shall calibrate and control remote field stations. (Deferred)

P2SSS21 The US NDC shall transmit calibration and control signals to all AFTAC-controlled sensor stations listed in the US NDC NDDOC dated April 2001. (Deferred)

P2SSS22 The US NDC shall provide a GUI to perform maintenance tasks associated with field site calibration, analysis, diagnostics, and communications. (Deferred)

P2SSS23 The US NDC shall remotely command, control, configure, and reconfigure, seismic hydroacoustic, and infrasonic field equipment. (Deferred)

P2SSS24 The US NDC shall provide a GUI that displays calibration analysis results from seismic, hydroacoustic, and infrasonic sites. (Deferred)

P2SSS25 The US NDC shall automatically update sensor calibration results for seismic, hydroacoustic, and infrasonic sites, provided the results are available in the protocol. (Deferred)

P2SSS26 The US NDC shall automatically update sensor calibration information for seismic, hydroacoustic, and infrasonic sites. (Deferred)

P2SSS27 The US NDC shall provide a GUI that displays frequency, amplitude, and phase response values for each seismic, hydroacoustic, and infrasonic site. (Deferred)

P2SSS28 The US NDC shall store frequency, amplitude, and phase response values for each seismic, hydroacoustic, and infrasonic site acquired at the US NDC. (Deferred)

3.2.2.4 Ancillary Data Acquisition

Ancillary data are received at the US NDC from the IDC, United States Geological Survey (USGS), and remote sensor sites. This data augments waveform and sensor data by reporting availability information. Ancillary data will be displayed using GFE.

P2SSS29 The US NDC shall automatically acquire all IDC waveform availability data in alphanumeric format within one hour of the IDC making the data available to the NDC.

P2SSS518 The US NDC shall automatically acquire all IDC bulletin data in alphanumeric format within one hour of the IDC making the data available to the NDC.

P2SSS31 The US NDC shall automatically acquire all USGS alphanumeric bulletin products in alphanumeric format within one hour of the USGS making the data available to the NDC.

P2SSS32 The US NDC shall acquire ancillary data available in CD 1.0 and 1.1 frames, from sensor sites.

P2SSS33 The US NDC shall provide a comprehensive GUI that displays ancillary data from sensor sites. The GUI will be integrated with station and sensor status displays. (Deferred)

3.2.2.5 Data Acquisition Statistics

Statistics are used to monitor acquisition integrity of data that are acquired. The statistics are gathered on a channel basis for all waveform data.

P2SSS34 The US NDC shall ensure data integrity through data acquisition statistics tracked on an individual channel basis as a function of time for seismic, hydroacoustic, and infrasonic waveform data. (Deferred)

P2SSS35 The US NDC data acquisition statistics shall track latency, gaps, and zero fills in data acquired at the US NDC unclassified and classified subsystems' front-end, and data acquired on the US NDC classified subsystem from the US NDC unclassified subsystem. (Deferred)

P2SSS36 The US NDC shall track station connections to the US NDC unclassified and classified subsystems' front-end.

3.2.2.6 Data Acquisition Integrity

Data acquisition integrity will be determined by continuously monitoring waveform data for missing or incomplete frames. Additionally, US NDC data acquisition processing will be continuously monitored to ensure processing functions are operating correctly.

P2SSS37 The US NDC shall distinguish between missing and incomplete waveform data if supported by the data transfer protocol.

P2SSS38 The US NDC shall automatically monitor the timing of acquired waveform data intervals by measuring the latency time between data recorded at the sensor and acquired at the front-end of the US NDC by using McTool, WorkFlow, and PerfMon.

P2SSS39 The US NDC shall automatically monitor and log missing waveform data.

3.2.3 Data Forwarding and Transfer Integrity

3.2.3.1 Data Forwarding

Waveform data are made available to other systems through data forwarding processes.

P2SSS40 The US NDC unclassified subsystem shall automatically forward all acquired waveform data to the classified subsystem within 60 seconds of receiving the data at the unclassified US NDC front-end.

P2SSS41 The US NDC shall automatically forward data, within 60 seconds of acquiring the data from US territorial stations identified in the Comprehensive Test Ban Treaty (CTBT), to the IDC.

3.2.3.2 Data Transfer Integrity

P2SSS42 The US NDC shall verify 100% of the available waveform data in the source buffers has transferred entirely and correctly to the destination buffers prior to any deletion command being given to the source buffers.

P2SSS43 The US NDC classified subsystem shall automatically generate a bulletin requesting re-transmission of corrupt and missing data from the unclassified subsystem. Missing/corrupt frames will be added to the bulleting when they are 60 seconds past-due (based on time of receipt of adjacent frames). Missing/corrupt frames will be removed from the bulleting as they arrive, or when more than ten days past-due.

P2SSS532 The US NDC classified subsystem shall acquire uncorrupted 99.999% of the waveform data frames forwarded from the unclassified subsystem. (This is a failure rate of approximately 1 frame per station every 12 days).

P2SSS487 The US NDC unclassified subsystem shall automatically request, when protocol allows, retransmission of corrupt and missing waveform data from any acquisition site within one hour of initial data transfer until all corrupt and missing data are acquired.

3.2.4 Processing Pipelines

The US NDC must accommodate several different processing paradigms. Each has a particular purpose to assure that all mission objectives are satisfied. Previous versions of the US NDC Phase 2 SRD defined five processing modes: Global, Broad Area Regional, Spotlight, Forward, Backward. Here it is assumed that it is technically feasible to include the capabilities of Broad Area Regional processing in the Global processing.

This section is used to define the various processing pipelines. Subsequent sections provide the details for which processes shall be performed in each pipeline.

3.2.4.1 Global Pipeline

The Global processing pipeline is the primary source of events. It uses a global network of stations to produce an event bulletin covering the entire earth. The global processing pipeline uses data from both seismic and hydroacoustic stations and runs continuously.

P2SSS44 The US NDC classified subsystem shall continuously perform Global processing.

P2SSS45 The US NDC classified subsystem shall automatically produce a Global bulletin using seismic and hydroacoustic stations, the latter being included with the hydroacoustic associations being added and seismic events relocated through Event-Driven Processing (EDP).

P2SSS46 The US NDC classified subsystem shall process and interpret teleseismic and regional seismic data during Global processing.

P2SSS47 The US NDC classified subsystem shall provide the capacity to simultaneously support up to two Broad Area processing regions within the Global processing pipeline.

P2SSS534 The US NDC classified subsystem shall provide the functionality to configure the data processing and display parameters on a station-by-station basis to suit the Broad-Area processing regions of interest within the Global processing pipeline.

P2SSS48 The US NDC classified subsystem shall provide initial Global processing results within 60 minutes of receipt of the seismic waveform data.

P2SSS514 In the event of an outage, the US NDC Global station processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration) ratio, under non-swarm conditions.

P2SSS515 In the event of an outage, the US NDC Global network processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration) ratio, under non-swarm conditions.

3.2.4.2 Spotlight Pipeline

The Spotlight processing pipeline looks for events located at specific places on earth. Because its scope is limited, one can process data at lower detection thresholds without fear of generating large numbers of false events. It also provides redundant processing of important areas. The pipeline runs continuously, but the regions of interest may change occasionally to meet changing mission objectives.

We are assuming new Spotlight pipelines will be added as GFE, including the region, network and data processing configuration [Special Operations (SPOPS) to Operations (OPS) transfer].

P2SSS49 The US NDC classified subsystem shall provide functionality to execute a Spotlight processing pipeline concentrating on specific source regions.

P2SSS50 The US NDC classified subsystem shall provide the capacity to support up to eight Spotlight regions as provided by GFE.

P2SSS51 The US NDC classified subsystem shall provide the capacity to perform Spotlight processing using up to eight seismic stations per Spotlight area as provided by GFE.

P2SSS52 The US NDC classified subsystem shall provide initial results of Spotlight processing within 30 minutes of the seismic waveform data becoming available.

P2SSS53 The US NDC classified subsystem shall support Spotlight regions as large as 1,000,000 square-km as provided by GFE.

P2SSS54 The US NDC classified subsystem shall provide functionality to configure Spotlight processing to suit the regions of interest.

P2SSS516 In the event of an outage, the US NDC Spotlight station processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration ratio), under non-swarm conditions.

3.2.4.3 Forward Pipeline

Like Spotlight processing, the Forward processing pipeline focuses on specific locations, but the emphasis is on finding events more quickly than the Global or Spotlight pipelines. The pipeline runs continuously, but the regions of interest may change occasionally to meet changing mission objectives.

P2SSS55 The US NDC classified subsystem shall provide functionality to execute a Forward processing pipeline concentrating on specific source regions.

P2SSS56 The US NDC classified subsystem shall provide the capacity to support up to ten Forward processing regions simultaneously.

P2SSS57 The US NDC classified subsystem shall provide the capacity to perform Forward processing using up to ten seismic stations per Forward processing region.

P2SSS58 The US NDC classified subsystem shall provide initial results of Forward processing within ten minutes of the seismic waveform data becoming available.

P2SSS59 The US NDC classified subsystem shall notify system operators immediately upon formation of an event in the Forward processing pipeline.

P2SSS60 The US NDC classified subsystem shall support Forward processing regions as large as 160,000 square-km.

P2SSS61 The US NDC classified subsystem shall provide the functionality to configure the data processing and display parameters on a station-by-station basis to suit the regions of interest within the Forward processing pipeline.

3.2.4.4 Backward Pipeline

The Backward processing pipeline is only run on demand. It is used to revisit data that has already been processed through the other processing pipelines based on some new information.

P2SSS62 The US NDC classified subsystem shall provide functionality to reprocess data in a limited time window using a Backward processing pipeline.

P2SSS63 The US NDC classified subsystem shall provide the capacity to perform Backward processing for up to two selected regions simultaneously.

P2SSS64 The US NDC classified subsystem shall provide temporary storage for Backward processing equivalent to 12 weeks of alphanumeric results from Global processing.

P2SSS65 The US NDC classified subsystem shall provide the capacity to store up to 48 hours of waveform data from the Global processing network in support of Backward processing.

P2SSS66 The US NDC classified subsystem shall provide functionality to configure Backward processing to suit the regions of interest.

P2SSS67 The US NDC classified subsystem shall provide Backward processing results within one minute of completion of processing.

P2SSS517 The US NDC Backward processing intervals shall successfully complete at no less than a 1:1 (data duration/processing duration) ratio, under non-swarm conditions.

3.2.5 Detection Processing

All routine automatic processing begins with detection processing of continuous data. Data acquired are processed in intervals on a station-by-station basis for the purpose of detecting signals of interest. The processing performs distinct functions:

- Data quality control -- identifies and repairs anomalous features in the data
- Beamforming -- stacks and filters collections of channels for signal enhancement
- Detection -- identifies signals in the data
- Feature measurement -- characterizes the signal
- Storage of results

These processes must be performed in real-time. Data processing must be completed in a time interval less than the time interval of the data processed.

3.2.5.1 Seismic Detection Processing

The following requirements apply to all processing pipelines and are applicable to all stations configured for data processing.

P2SSS68 The US NDC classified subsystem shall perform detection processing on continuous data from seismic stations.

P2SSS69 The US NDC classified subsystem shall perform seismic detection processing on data intervals at least two minutes in duration.

P2SSS70 The US NDC classified subsystem shall automatically apply detection processing to late-arriving data.

3.2.5.2 Hydroacoustic Detection Processing

P2SSS71 The US NDC classified subsystem shall perform detection processing on continuous data from hydroacoustic stations.

P2SSS72 The US NDC classified subsystem shall perform hydroacoustic detection processing on data intervals at least ten minutes in duration.

P2SSS73 The US NDC classified subsystem shall provide the capacity to process up to 55 hydroacoustic channels at a sample rate of 250 samples per second in the Global pipeline.

3.2.5.3 Detection Processing Configuration

It is important to provide flexible environment for configuration of signal processing parameters. Each station has individual characteristics that can change with time. The environment must permit new stations to be added conveniently and tuned with operational experience.

P2SSS74 The US NDC classified subsystem shall provide functionality to configure detection processing parameters on a detector channel-by-detector channel basis.

P2SSS75 The US NDC classified subsystem shall provide functionality to configure detection processing parameters to focus on a specific source region.

P2SSS76 The US NDC classified subsystem shall obtain site-specific station geometry from the database.

3.2.5.4 Data Quality Control

Prior to any waveform processing, the data must be examined to identify and repair portions of the data that may interfere with signal detection.

P2SSS77 The US NDC classified subsystem shall provide functionality to identify and repair single-point spikes in waveform data.

P2SSS78 The US NDC classified subsystem shall provide functionality to identify and mark data gaps in waveform data.

P2SSS79 The US NDC classified subsystem shall provide functionality to identify and remove array waveform channels with anomalous amplitudes.

P2SSS80 The US NDC classified subsystem shall provide functionality to mask data quality control problems that cannot be repaired.

P2SSS81 The US NDC classified subsystem shall provide functionality to demean input waveform segments.

P2SSS82 The US NDC classified subsystem shall provide functionality to determine data quality statistics automatically.

P2SSS489 The US NDC classified subsystem shall provide functionality to allow insertion of new algorithms for data quality control.

3.2.5.5 Detection

Detection is the process of scanning the input waveform data to identify signals that might be from seismic events. The data are first formed into beams and filtered to enhance particular types of signals from particular points on the earth. There can be hundreds of such beams per station. The data are then processed to detect sudden increases in amplitude, changes in frequency content or sudden correlation in the background noise. There is a need for many kinds of detectors because of the differences in the kinds of signals of interest and differences in the characteristics of the noise at particular stations.

3.2.5.5.1 Beamforming during Detection

Detection can be performed on raw channels or beams. This section describes the beams that will be supported in the US NDC.

P2SSS83 The US NDC classified subsystem shall provide functionality to form coherent beams at array sites steered to a given azimuth and slowness prior to detection.

P2SSS84 The US NDC classified subsystem shall provide functionality to form incoherent beams at array sites steered to a given azimuth and slowness prior to detection.

3.2.5.5.2 Filtering

P2SSS85 The US NDC classified subsystem shall provide functionality to filter raw channels or beams using Butterworth IIR filters prior to detection.

P2SSS488 The US NDC classified subsystem shall provide functionality to allow the insertion of new types of filters.

3.2.5.5.3 Detectors

A variety of detectors will be supported in the US NDC.

P2SSS86 The US NDC classified subsystem shall provide functionality to detect signals using the STA/LTA detector.

P2SSS87 The US NDC classified subsystem shall provide functionality to detect signals using the Z detector.

P2SSS88 The US NDC classified subsystem shall provide functionality to detect signals using the log-Z detector.

P2SSS89 The US NDC classified subsystem shall provide functionality to detect signals using the auto-regressive detector as provided by GFE.

P2SSS90 The US NDC classified subsystem shall provide functionality to detect signals using the F-statistic detector as provided by GFE.

P2SSS91 The US NDC classified subsystem shall provide functionality to detect signals using the waveform correlation detector as provided by GFE, if this Phase 1 Upgrade capability is available prior to the Build 1 software baseline freeze.

P2SSS92 The US NDC classified subsystem shall provide functionality to allow insertion of new detector algorithms.

3.2.5.5.4 Detection Thresholds

P2SSS93 The US NDC classified subsystem shall perform signal detection using detection thresholds approved by the Government.

3.2.5.5.5 Redundant Detections

P2SSS94 The US NDC classified subsystem shall provide functionality to identify and cull signal detections occurring on multiple beams.

3.2.5.5.6 Detection Loading

Storage must be provided for detections and features associated with all processing pipelines. For requirements in this section, it is assumed that the US NDC system life is five (5) years from delivery.

P2SSS95 The US NDC classified subsystem shall provide the capacity to store up to 60,000 detections per day stored online for the life of the system.

3.2.5.6 Seismic Signal Feature Measurement

After a seismic signal is detected, it is characterized by feature measurements.

P2SSS96 The US NDC classified subsystem shall measure signal back-azimuth and slowness for detected phases at array stations using FK techniques.

P2SSS97 The US NDC classified subsystem shall determine the F-statistic and estimate uncertainties in measured azimuth and slowness obtained from FK analysis.

P2SSS98 The US NDC classified subsystem shall measure signal back-azimuth and slowness for P-type phases at three-component stations using polarization techniques.

P2SSS99 The US NDC classified subsystem shall estimate onset times of detecting short-period signals.

P2SSS100 The US NDC classified subsystem shall estimate the ratio of signal to noise amplitude for each detected signal.

P2SSS101 The US NDC classified subsystem shall estimate the dominant period of detected signals.

P2SSS484 The US NDC classified subsystem shall provide the functionality to make measurements on processed and unprocessed data.

3.2.5.6.1 Amplitude

P2SSS102 The US NDC classified subsystem shall provide functionality to measure peak-to-trough amplitudes in user specified time windows.

P2SSS103 The US NDC classified subsystem shall provide functionality to measure amplitude in moving STA windows.

P2SSS104 The US NDC classified subsystem shall provide functionality to correct amplitude measurements for instrument response at the observed period.

3.2.5.7 Hydroacoustic Signal Feature Measurement

P2SSS105 The US NDC classified subsystem shall estimate features from hydroacoustic signals as provided by GFE.

3.2.5.8 Post-detection Beamforming

P2SSS106 The US NDC classified subsystem shall provide functionality to store a representative beam for each detection.

3.2.5.9 Storage of Results

P2SSS107 The US NDC classified subsystem shall store data quality statistics, detection information and measured features for use by later processing.

3.2.6 Phase Identification and Event Formation

Event hypotheses are formed by identifying signals and by associating those that emanate from common events. This process is performed automatically following signal detection.

3.2.6.1 General Capabilities

P2SSS108 The US NDC classified subsystem shall automatically perform phase identification in each processing pipeline.

P2SSS109 The US NDC classified subsystem shall automatically group phases from common events in all processing pipelines.

3.2.6.2 Phase Identification

Phase identification is the process of determining the type of wave and path through the earth of a detected signal. This is first performed using the measured features of the signals. If a signal can be associated with a particular event hypothesis, the identification can be improved using the context of the event.

P2SSS110 The US NDC classified subsystem shall automatically provide initial phase identification for each detected signal based upon measured features of that detection.

P2SSS111 The US NDC classified subsystem shall identify teleseismic phases.

P2SSS112 The US NDC classified subsystem shall automatically differentiate primary and secondary teleseismic phases.

P2SSS113 The US NDC classified subsystem shall provide functionality to automatically identify local and regional seismic P and S phases in selected regions.

P2SSS114 The US NDC classified subsystem shall automatically identify hydroacoustic H and T phases.

P2SSS115 The US NDC classified subsystem shall provide functionality to configure initial phase identification to use station-dependent methods.

3.2.6.3 Automatic Association

Association is the process of grouping signals that emanate from common events. It is performed at both a station and network level. If enough signals are grouped with an event, it can be located.

P2SSS116 The US NDC classified subsystem shall automatically group teleseismic signals from a single station that emanates from the same event.

P2SSS490 The US NDC classified subsystem shall automatically group regional seismic signals from a single station that emanates from the same event.

P2SSS117 The US NDC classified subsystem shall automatically group hydroacoustic signals from a single station that emanates from the same event.

P2SSS118 The US NDC classified subsystem shall automatically associate all signals from a network of seismic stations that emanate from the same event using travel-time prediction and signal features.

P2SSS119 The US NDC classified subsystem shall provide functionality to automatically refine phase identification after association to an event.

P2SSS120 The US NDC classified subsystem shall associate a given detection to no more than one event in a given pipeline.

P2SSS121 The US NDC classified subsystem shall provide functionality to automatically associate hydroacoustic phases to events formed using the seismic technique.

P2SSS122 The US NDC classified subsystem shall provide functionality to utilize the best path-dependent information available on the system during automatic association.

P2SSS123 The US NDC classified subsystem shall provide functionality to automatically associate detected signals with existing event hypotheses as those detections become available.

P2SSS467 The US NDC classified subsystem shall automatically perform long-period signal detection and processing through Event-Driven Processing (EDP), to associate long-period phases to events formed using short-period seismic signals, if this Phase 1 Upgrade capability is available prior to the Build 1 software baseline freeze.

P2SSS124 The US NDC classified subsystem shall retain event hypotheses meeting configurable acceptance criteria.

3.2.6.4 Automatic Event Location

P2SSS125 The US NDC classified subsystem shall provide functionality to automatically locate events using signal arrival time, back azimuth and slowness.

P2SSS126 The US NDC classified subsystem shall automatically locate all events satisfying configurable minimum-data criteria.

P2SSS127 The US NDC classified subsystem shall provide functionality to automatically locate events using seismic signals, hydroacoustic signals or combinations thereof.

P2SSS128 The US NDC classified subsystem shall automatically locate events at depth for events satisfying configurable criteria.

P2SSS129 The US NDC classified subsystem shall estimate uncertainties in all computed locations, including predicted data residuals.

P2SSS130 The US NDC classified subsystem shall provide functionality to use the best available information in the US NDC system for automatic location.

P2SSS131 The US NDC classified subsystem shall provide functionality to use travel-time correction surfaces and regional travel-time tables provided by GFE for automatic location.

3.2.6.5 Automatic Event Magnitude

P2SSS132 The US NDC classified subsystem shall automatically determine event magnitudes for all located events with sufficient amplitude measurements for the purpose of characterizing the event source.

P2SSS133 The US NDC classified subsystem shall automatically determine mb.

P2SSS134 The US NDC classified subsystem shall provide functionality to determine maximum-likelihood estimates of mb and Ms.

P2SSS135 The US NDC classified subsystem shall provide functionality to automatically determine regional magnitude in selected regions, as provided by GFE.

P2SSS136 The US NDC classified subsystem shall provide functionality to configure regional magnitude processing to selected regions of interest.

P2SSS137 The US NDC classified subsystem shall estimate the uncertainties of all computed magnitudes.

P2SSS138 The US NDC classified subsystem shall provide functionality to use the best available attenuation information in the US NDC system for automatic magnitude determination.

3.2.6.6 Storage of Results

P2SSS139 The US NDC classified subsystem shall store the results of phase identification, association, location and magnitude estimation to be accessible by subsequent processes.

P2SSS140 The US NDC classified subsystem shall store origin beams and detection beams for associated detections for each event.

3.2.7 Event Identification

Event identification is the process of determining the physical nature of an event (earthquake, explosion, etc.) that has been located and characterized. The analysis used in this process considers discriminants and physical observations that can be used to differentiate one or more source types.

Event identification is a complex scientific problem and some of the algorithms to be used are likely to come in the form of GFE that has yet to be developed. It is the focus here to concentrate on the engineering framework needed to satisfy mission requirements.

The Phase 2 Build 1 system will employ the same discrimination methodology as the Phase 1 system.

P2SSS141 The US NDC classified subsystem shall perform post-analysis event identification.

P2SSS142 The US NDC classified subsystem shall provide functionality to perform event identification in the Global processing pipeline.

P2SSS143 The US NDC classified subsystem shall classify events using teleseismic discriminants consistent with the rules given in "Event Classification Procedures for the Seismic Technique (REF 11)", dated 5 April 1982.

P2SSS144 The US NDC classified subsystem shall determine if an event is located within the Area-Of-Interest (AOI) and store that designation with other event information.

P2SSS145 The US NDC classified subsystem shall provide functionality to modify the AOI to meet changing mission objectives.

P2SSS146 The US NDC classified subsystem shall store the results of event identification with other event information for use by subsequent processing and analysis.

3.2.8 Tuning Support Tools

Tuning tools will be provided to assist in the tuning of automatic processes.

P2SSS147 The US NDC classified subsystem shall provide functionality to train neural networks for initial wave-type identification.

P2SSS148 The US NDC classified subsystem shall provide functionality to compute new Bayesian inference tables for regional phase identification from historical data.

P2SSS149 The US NDC classified subsystem shall provide functionality to create and view grid files used in automated network association.

P2SSS150 The US NDC classified subsystem shall provide documentation to assist in testing and understanding the functions and primary configuration parameters of the system used for automated network association.

3.2.9 Analysis

This section contains requirements for interactive analysis. Many of these requirements apply to both the Headquarters System and the Training System and will be mapped to both SRD requirements where applicable.

3.2.9.1 General Capabilities for Analysis

P2SSS151 The US NDC classified subsystem shall provide functionality to review the results of all automatic processing.

P2SSS152 The US NDC classified subsystem shall provide interactive functionality to edit the results of all automatic processing.

P2SSS153 The US NDC classified subsystem shall provide interactive functionality to edit stored analysis results.

P2SSS154 The US NDC classified subsystem shall provide functionality to compare results of automatic processing to all analyzed results.

P2SSS155 The US NDC classified subsystem shall retain all original processing results when edited.

P2SSS156 The US NDC classified subsystem shall permit analysis of results without impact to automatic processing.

P2SSS157 The US NDC classified subsystem shall provide access to and the functionality to include all available data during analysis, including data not available at the time of previous processing.

P2SSS411 The US NDC classified subsystem shall provide the functionality to interactively process acquired waveform data from auxiliary seismic stations, if this Phase 1 Upgrade functionality is available prior to the Build 1 software baseline freeze.

P2SSS158 The US NDC classified subsystem shall store the results of each analysis stage.

3.2.9.2 Analysis Preprocessing

P2SSS492 The US NDC classified subsystem shall provide the functionality to automatically prepare detection beams for array sensor stations, from frequency-wave number (FK) processing, for display during analysis.

P2SSS159 The US NDC classified subsystem shall provide functionality to automatically prepare origin beams for array sensor stations, in the predicted arrival time window and steered to an event, for display during analysis.

P2SSS160 The US NDC classified subsystem shall provide functionality to automatically determine hydroacoustic azimuths in preparation for analysis.

P2SSS161 The US NDC classified subsystem shall provide functionality to perform automatic processing between each stage of analysis.

P2SSS483 The US NDC classified subsystem shall provide the functionality to prepare teleseismic and regional beams for short-period, broadband and long-period seismic signals, for display during analysis.

3.2.9.3 Interactive Event Refinement

P2SSS162 The US NDC classified subsystem shall provide functionality to display data for each waveform type individually by technique.

P2SSS163 The US NDC classified subsystem shall provide functionality to manipulate waveform data, including scrolling, zooming and filtering of the data.

P2SSS164 The US NDC classified subsystem shall provide functionality to edit any measurement used for location, magnitude or discriminant analysis.

P2SSS165 The US NDC classified subsystem shall provide functionality to modify phase identification of data used for event location.

P2SSS166 The US NDC classified subsystem shall provide interactive functionality to compute event location.

P2SSS167 The US NDC classified subsystem shall automatically compute, display, and save event location results for depth constrained to the surface of the earth, depth unconstrained, and a user-selected depth, and use the results in subsequent processing.

P2SSS168 The US NDC classified subsystem shall provide interactive functionality to select those data that are defining for event location.

P2SSS169 The US NDC classified subsystem shall provide functionality for specifying user-selected location parameters.

P2SSS170 The US NDC classified subsystem shall provide functionality to specify travel-time tables used for location.

P2SSS171 The US NDC classified subsystem shall provide functionality to select any available regionalized corrections to travel-times tables.

P2SSS172 The US NDC classified subsystem shall provide functionality to perform event location using test-site travel-time corrections.

P2SSS173 The US NDC classified subsystem shall provide interactive functionality to compute all event magnitudes used in the system.

P2SSS174 The US NDC classified subsystem shall provide interactive functionality to select those data that are defining for event magnitude, while preserving all individual station magnitudes.

P2SSS175 The US NDC classified subsystem shall provide interactive functionality to allow user selection of magnitude parameters.

P2SSS176 The US NDC classified subsystem shall provide functionality to specify attenuation tables used for magnitude.

P2SSS177 The US NDC classified subsystem shall provide functionality to compute magnitude using test-site magnitude corrections.

3.2.9.4 Interactive Data Processing Support

P2SSS178 The US NDC classified subsystem shall provide functionality to use all automatic processing algorithms during interactive analysis.

P2SSS179 The US NDC classified subsystem shall provide functionality to interactively generate origin and detection beams.

P2SSS180 The US NDC classified subsystem shall provide functionality to form beams for three-component data using polarization techniques.

P2SSS181 The US NDC classified subsystem shall provide functionality to modify detection beam parameters.

P2SSS182 The US NDC classified subsystem shall by default generate beams with parameters identical to those used in automatic processing.

P2SSS183 The US NDC classified subsystem shall provide interactive functionality to determine back azimuth and apparent velocity from array data using FK analysis.

P2SSS184 The US NDC classified subsystem shall provide functionality to modify parameters controlling FK analysis.

P2SSS185 The US NDC classified subsystem shall provide functionality to determine back azimuth and apparent velocity for P- and LR-type waves from three-component seismic stations using polarization analysis.

P2SSS186 The US NDC classified subsystem shall provide functionality to interactively review hydroacoustic azimuths determined in pre-analysis processing.

P2SSS187 The US NDC classified subsystem shall provide functionality to automatically perform event formation using user-selected detections.

P2SSS188 The US NDC classified subsystem shall provide functionality to automatically determine signal-to-noise ratios for analyst-added detections.

P2SSS485 The US NDC classified subsystem shall provide the functionality to interactively initiate all Event-Driven Processing (EDP) functions.

3.2.9.5 Analysis of Discrimination Results

P2SSS189 The US NDC classified subsystem shall provide functionality for reviewing selected seismic discrimination results.

P2SSS190 The US NDC classified subsystem shall provide interactive functionality for selection of those data used in seismic discriminant analysis.

P2SSS191 The US NDC classified subsystem shall provide interactive functionality to modify discrimination results.

P2SSS192 The US NDC classified subsystem shall provide functionality for reviewing hydroacoustic discrimination results, as provided by GFE.

P2SSS193 The US NDC classified subsystem shall provide interactive functionality for selection of those data used in hydroacoustic discriminant analysis, as provided by GFE.

P2SSS194 The US NDC classified subsystem shall provide functionality to review the results of event identification.

P2SSS195 The US NDC classified subsystem shall provide functionality for user-selection of discriminants to be used in event identification.

3.2.9.6 Use of Geographical Information

P2SSS196 The US NDC classified subsystem shall provide functionality to automatically access, spatially manipulate, and spatially process geographically referenced information required for data processing provided by GFE.

P2SSS197 The US NDC classified subsystem shall provide functionality to store, manage, maintain, analyze, and manipulate spatial data as provided by GFE.

P2SSS198 The US NDC classified subsystem shall provide the functionality to maintain change control of geographical information in the system, including the history of data updates and modifications, as provided by GFE.

P2SSS199 The US NDC classified subsystem shall provide functionality to display and process geographical information as provided by GFE.

P2SSS200 The US NDC classified subsystem shall provide functionality to display event, detection and station information in conjunction with spatial data.

P2SSS201 The US NDC classified subsystem shall provide interactive functionality to manipulate and process spatial data as provided by GFE.

P2SSS202 The US NDC classified subsystem shall provide functionality to generate high quality graphical and tabular presentations of the results of spatial processing of geographical data as provided by GFE.

3.2.10 Generation of Bulletin Products

P2SSS203 The US NDC classified subsystem shall provide functionality to generate bulletins for all processing modes.

P2SSS204 The US NDC classified subsystem shall provide functionality to generate bulletins after all processing stages, in automated processing and in interactive analysis, that result in event forming.

P2SSS205 The US NDC classified subsystem shall provide functionality to generate event bulletins containing information about the network solution (latitude, longitude, time, depth, magnitude) and information about station associations.

P2SSS206 The US NDC classified subsystem shall perform comparisons between two bulletins that will identify common events and characterize the differences in their solutions.

P2SSS207 The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using event information.

P2SSS208 The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using both event and arrival information.

3.2.11 Data Processing Performance Monitoring

The US NDC shall continuously monitor activities to diagnose problems and collect information that can be used to improve the system performance.

P2SSS209 The US NDC classified subsystem shall provide functionality to automatically monitor data processing functions.

P2SSS210 The US NDC classified subsystem shall provide functionality to interactively monitor data processing functions through a GUI.

P2SSS211 The US NDC classified subsystem shall provide functionality to evaluate the performance of data processing functions using specified metrics.

P2SSS212 The US NDC classified subsystem shall provide functionality to automatically generate performance monitoring reports as regularly scheduled products.

P2SSS213 The US NDC classified subsystem shall provide interactive functionality to generate performance monitoring reports.

P2SSS214 The US NDC classified subsystem shall provide functionality to automatically collect historical averages of station detection rates.

P2SSS215 The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical comparisons between stored results from any processing stage in any pipeline mode of the US NDC.

P2SSS216 The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical bulletin comparisons between stored results of the US NDC and other

operational systems whose results are stored using the applicable version of the US NDC Database Schema.

P2SSS217 The US NDC classified subsystem shall provide functionality to generate graphical displays of bulletin comparisons, including event maps and graphs of location differences.

P2SSS218 The US NDC classified subsystem shall provide functionality to interactively customize performance monitoring reports, including selection of time windows and comparisons to include.

P2SSS219 The US NDC classified subsystem shall provide functionality to display in color a generated performance report.

P2SSS220 The US NDC classified subsystem shall provide functionality to generate color copies on paper and transparencies of a generated performance report.

P2SSS221 The US NDC classified subsystem shall provide functionality to monitor the timeliness of data acquisition and processing milestones on the classified subsystem.

P2SSS222 The US NDC classified subsystem shall provide functionality to monitor the availability of expected data on the classified subsystem, for stations that are processed.

P2SSS223 The US NDC classified subsystem shall provide functionality to monitor the quality of acquired data, including percentage of data masked due to spikes or drop-outs, and the number of masked segments, for stations that are processed.

P2SSS224 The US NDC classified subsystem shall provide functionality to monitor station noise levels for acquired data, for stations that are processed.

P2SSS225 The US NDC classified subsystem shall provide functionality to monitor station detection thresholds using Chi-square analysis.

P2SSS226 The US NDC classified subsystem shall provide functionality to monitor station detection rates.

P2SSS227 The US NDC classified subsystem shall provide functionality to monitor the rates of associated automated detections and of analyst-added phases.

P2SSS228 The US NDC classified subsystem shall provide functionality to monitor the accuracy of amplitude and period measurements.

P2SSS229 The US NDC classified subsystem shall provide functionality to monitor the accuracy of slowness estimation through statistical analysis of slowness residuals.

P2SSS230 The US NDC classified subsystem shall provide functionality to monitor the accuracy of azimuth estimation through statistical analysis of azimuth residuals.

P2SSS231 The US NDC classified subsystem shall provide functionality to monitor the accuracy of arrival time estimation through statistical analysis of time residuals.

P2SSS232 The US NDC classified subsystem shall provide functionality to graphically display the geographic, depth and magnitude distributions of events formed by the automated processing or after analyst review.

P2SSS233 The US NDC classified subsystem shall provide functionality to monitor the accuracy of initial phase identification.

P2SSS234 The US NDC classified subsystem shall provide functionality to monitor the accuracy of final phase identification after event location.

P2SSS235 The US NDC classified subsystem shall provide functionality to monitor the performance of hydroacoustic event-driven processing.

P2SSS236 The US NDC classified subsystem shall provide functionality to perform statistical evaluations of automated events that are not validated (false alarms).

P2SSS237 The US NDC classified subsystem shall provide functionality to perform statistical evaluations of missed events and missed associations.

P2SSS238 The US NDC classified subsystem shall provide functionality to perform statistical evaluations of events common to the automated bulletin and an analyst-reviewed bulletin.

P2SSS239 The US NDC classified subsystem shall provide functionality to monitor the use of locating phases in interactive analysis, including teleseismic branches, regional phases and depth phases.

P2SSS240 The US NDC classified subsystem shall provide interactive functionality to monitor the retiming of arrivals in interactive analysis.

P2SSS241 The US NDC classified subsystem shall provide interactive functionality to monitor the association and disassociation of automated detections in interactive analysis.

3.2.12 Training System Capabilities

3.2.12.1 Training System General Capabilities

P2SSS242 The US NDC Training System shall provide all analysis tools available in the US NDC classified subsystem.

P2SSS243 The US NDC Training System shall provide the instructor with access to all analysis and maintenance functions.

P2SSS244 The US NDC Training System shall provide compatible software to allow interaction between student and instructor workstations for both analysis and computer-assisted instruction.

P2SSS461 The US NDC Training System shall provide functionality to edit any measurement used for location, magnitude or discriminant analysis.

P2SSS462 The US NDC Training System shall retain all original processing results when edited.

P2SSS463 The US NDC Training System shall store the results of each analysis stage.

P2SSS464 The US NDC Training System shall provide functionality to automatically perform event formation using user-selected detections.

P2SSS245 The US NDC Training System shall project instructor workstation activities to student workstation displays.

P2SSS246 The US NDC Training System shall project student activities to the instructor workstation display.

P2SSS465 The US NDC Training System shall provide interactive functionality to select those data that are defining for event magnitude.

P2SSS470 The US NDC Training System shall provide the functionality to automatically generate event reports.

P2SSS471 The US NDC Training System shall provide the functionality to include in event reports the following event attributes: latitude, longitude, depth/elevation, time, magnitude, priority, discrimination data, waveform graphics, event summary text.

3.2.12.2 Training System Process Control

P2SSS247 The US NDC Training System shall provide functionality to execute processes for analysis data preparation and student account management from the instructor workstation.

P2SSS248 The US NDC Training system shall provide functions necessary to interrupt processes for analysis data preparation and student account management from the instructor workstation.

P2SSS249 The US NDC Training System shall notify the instructor of the failure of processes for analysis data preparation and student account management.

P2SSS250 The US NDC Training System shall log all processes for analysis data preparation and student account management.

P2SSS251 The US NDC Training System shall automatically store all classified data processing results.

3.2.13 Training System Data Preparation

P2SSS252 The US NDC Training System shall provide the functions necessary to automatically generate detection beams using parameters derived from frequency-wave number analysis.

P2SSS253 The US NDC Training System shall provide the functions necessary to automatically generate origin beams for the primary P wave steered to origins in the database.

P2SSS254 The US NDC Training System shall provide the functions necessary to automatically generate origin beams for long-period phases for origins in the database.

P2SSS255 The US NDC Training System shall provide functionality to configure all beam parameters.

3.2.14 US NDC Phase 2 Build 1 Compatibility with US NDC Phase 1 Capabilities

The US NDC Phase 2 system is required to meet the capabilities of the US NDC Phase 1 system. The following requirements are intended to be a set of checks which ensure that major capabilities are not lost or degraded in the Phase 2 Build 1 system. The metrics for US NDC Phase 1 capabilities defined by these requirements will be those measured at the time of the US NDC Phase 2 Build 1 Critical Design Review (CDR).

P2SSS256 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the rate of analyst-verified detections.

P2SSS257 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of onset time.

P2SSS258 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of amplitude and period.

P2SSS259 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of array vector slowness.

P2SSS260 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the rate of analyst-verified automated events.

P2SSS261 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to read intervals of both seismic and hydroacoustic data in interactive analysis.

P2SSS262 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to scroll displayed channels of both seismic and hydroacoustic data in interactive analysis.

P2SSS263 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to perform beamforming of seismic data in interactive analysis.

P2SSS264 The US NDC classified Phase 2 subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to perform frequency-wave number FK analysis of seismic data in interactive analysis.

P2SSS265 The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to run automated pipeline processes (e.g., HydroEDP) between analysis stages in interactive analysis.

3.3 System External Interface Requirements

The US NDC receives data from a number of external sources and forwards data to external clients via external interfaces from both the Unclassified and Classified subsystems. Data include sensor data in a variety of specified formats and protocols as well as the common Internet services such as e-mail, Network File System (NFS), and File Transfer Protocol (FTP). In most cases, these data arrive by individual external communications circuits that are combined by a wide area network (WAN) router and placed on the AFTAC broadband networks for delivery to the US NDC. Specification of the WAN circuits is beyond the scope of this document. This section specifies the physical interface to AFTAC networks that deliver data to the US NDC and the data types and protocols that flow over these physical interfaces.

3.3.1 Interface Identification and Diagrams

3.3.1.1 Unclassified Interface Identification and Diagrams

Table 2. Unclassified External Interface Identification

IDENTIFIER	INTERNAL ENTITY	EXTERNAL ENTITY	CHARACTERISTICS
USNDC_AFTAC_UBBN	US NDC	AFTAC Unclassified Broadband Network	Fixed (interface format known)

3.3.1.2 Classified Interface Identification and Diagrams

Table 3. Classified External Interface Identification

IDENTIFIER	INTERNAL ENTITY	EXTERNAL ENTITY	CHARACTERISTICS
USNDC_AFTAC_CBBN	US NDC	AFTAC Classified Broadband Network	Fixed
USNDC_ADSNARCH	US NDC	ADSN Classified Archive System	Fixed
USNDC_AFTAC_HYDRO	US NDC	AFTAC Classified Hydro System	Fixed

3.3.2 External Interfaces

3.3.2.1 Unclassified External Interfaces

3.3.2.1.1 USNDC_AFTAC_UBBN

P2SSS266 The US NDC unclassified subsystem shall support a physical interface to the existing AFTAC Headquarters unclassified network.

P2SSS267 The US NDC unclassified subsystem shall receive all data from unclassified external sources via its connection to the existing AFTAC Headquarters unclassified network.

P2SSS268 The US NDC unclassified subsystem shall forward all data to unclassified external clients via its connection to the existing AFTAC Headquarters unclassified network.

P2SSS269 The US NDC unclassified subsystem shall be capable of exchanging electronic mail with other AFTAC unclassified Local Area Networks (LAN), other external sources and clients, and the Internet via the AFTAC Headquarters unclassified network.

P2SSS270 The US NDC unclassified subsystem shall provide read-only access to selected files and database tables to other AFTAC unclassified LANs via the AFTAC Headquarters unclassified network.

P2SSS271 The US NDC unclassified subsystem shall obtain Network Time Protocol (NTP)-based time information via a time source on the AFTAC Headquarters unclassified network.

3.3.2.2 Classified External Interfaces

3.3.2.2.1 USNDC_AFTAC_CBBN

P2SSS273 The US NDC classified subsystem shall support a physical connection to the existing AFTAC Headquarters classified network.

P2SSS274 The US NDC classified subsystem shall be capable of exchanging electronic mail with other AFTAC classified LANs via the AFTAC Headquarters classified network.

P2SSS275 The US NDC classified subsystem shall provide read-only access to selected files and database tables. This access will be granted to other AFTAC classified LANs via the AFTAC Headquarters classified network.

P2SSS276 The US NDC classified subsystem shall obtain NTP-based time information via a time source on the AFTAC Headquarters classified network.

P2SSS499 The US NDC classified subsystem shall provide read and execution access to system applications, parameter and recipe files, and documentation from the AFTAC Headquarters classified network.

3.3.2.2.2 USNDC_ADSNARCH

P2SSS277 The US NDC shall support a physical interface to the ADSN archive system.

P2SSS278 The US NDC shall have read-only access to the waveform files and database of the ADSN archive system.

3.3.2.2.3 USNDC_AFTAC_HYDRO

P2SSS279 The US NDC shall support a physical interface to the AFTAC Hydro system.

P2SSS280 The US NDC shall receive hydroacoustic waveform data via its physical interface to the AFTAC Hydro system.

3.3.2.3 Training System External Interfaces

There are no Training System external interfaces.

3.3.3 Interface Protocols

P2SSS511 The US NDC shall support the Transport Control Protocol/Internet Protocol (TCP/IP) suite for communications over the physical interfaces it supports.

P2SSS283 The US NDC shall support Simple Mail Transfer Protocol (SMTP) for all electronic mail communications via its external interfaces.

P2SSS284 The US NDC shall support NTP for synchronization of all processors to a common time standard.

P2SSS285 The US NDC shall forward waveform data to clients using the CD 1.0 and CD 1.1 protocols.

P2SSS286 The US NDC shall receive waveform data using the CD 1.0 and CD 1.1 protocols from all stations which support these protocols.

P2SSS287 The US NDC shall receive waveform data from USAEDS stations using the Data Transaction Center (DTC) protocol.

P2SSS288 The US NDC shall receive waveform data from ASN stations in the form of CSS 3.0 datafiles.

P2SSS289 The US NDC shall receive waveform data from LANL in the form of SUDS datafiles.

3.4 System Internal Interface Requirements

3.4.1 Interface Identification and Diagrams

3.4.1.1 Unclassified Interface Identification and Diagrams

There are no unclassified internal interfaces from the US NDC to the US NDC Training System.

3.4.1.2 Classified Interface Identification and Diagrams

Table 4. Classified Internal Interface Identification

IDENTIFIER	INTERNAL ENTITY	EXTERNAL ENTITY	CHARACTERISTICS
USNDC_CTS	US NDC	US NDC Training System	Fixed

3.4.2 Internal Interfaces

3.4.2.1 Unclassified Internal Interfaces

There are no unclassified internal interfaces from the US NDC to the US NDC Training System.

3.4.2.2 Classified Internal Interfaces

3.4.2.2.1 USNDC_CTS

P2SSS290 The US NDC classified subsystem shall provide functions to write data to portable media readable by the US NDC Training System.

3.4.2.3 US NDC Training System Internal Interfaces

3.4.2.3.1 Process Control Interface

P2SSS291 The US NDC Training System shall provide a GUI to monitor the status of processes for analysis data preparation.

P2SSS292 The US NDC Training System shall provide a GUI to monitor the status of processes for student account management.

3.4.2.3.2 Data Preparation Interface

P2SSS293 The US NDC Training System shall be designed to allow loading of alphanumeric data obtained from the US NDC in Oracle export format.

P2SSS294 The US NDC Training System shall provide functionality to load waveform data from the US NDC available in Unix tar format.

P2SSS295 The US NDC Training System shall provide functionality to read data from portable media prepared on the US NDC.

P2SSS296 The US NDC Training System shall provide a GUI to form detection beams on array detections in a user-selected time interval.

P2SSS297 The US NDC Training System shall provide a GUI to form origin beams on origins in a user-selected time interval.

P2SSS298 The US NDC Training System shall provide a GUI to load waveform and alphanumeric data over a user-selected time interval.

P2SSS299 The US NDC Training System shall provide a GUI to delete waveform and alphanumeric data over a user-selected time interval.

3.4.2.3.3 Data Account Interface

P2SSS300 The US NDC Training System shall support sets of individual database accounts for twelve (12) students to allow each student to perform individual analysis for each of the following processing modes: global, hydro, spotlight and forward.

P2SSS301 The US NDC Training System shall provide a GUI to create student database accounts.

P2SSS302 The US NDC Training System shall provide a GUI to remove student database accounts.

P2SSS303 The US NDC Training System student accounts shall have access to all data prepared by the instructor.

3.4.3 Interface Protocols

The US NDC protocol for its classified US NDC Training System interface is Center for Seismic Studies (CSS) database format delivered on magnetic media.

3.5 System Internal Data Requirements

3.5.1 Backup and Restore Functionality

All waveform and alphanumeric data acquired, generated, or archived by the US NDC will be automatically or interactively backed up to off-line storage. All off-line data can be automatically and/or interactively restored to on-line storage. On-line storage is defined as data that are electronically accessible without loading any magnetic media, such as digital linear tapes (DLTs). Off-line storage is defined as data that are accessible only by loading magnetic media.

3.5.1.1 Backup Functionality

P2SSS304 The US NDC shall automatically backup all on-line waveform data.

P2SSS305 The US NDC shall automatically backup all off-line waveform data.

P2SSS306 The US NDC shall automatically backup all alphanumeric data.

P2SSS307 The US NDC automated backup functionality shall be capable of running concurrently with automated data acquisition, data processing, and data storage functions.

3.5.1.2 Restore Functionality

P2SSS308 The US NDC shall incorporate functionality to restore all backup waveform data.

P2SSS309 The US NDC classified subsystem shall restore all backup alphanumeric data.

3.5.2 Internal data formats

P2SSS310 The US NDC shall store waveform data in CSS 3.0 wfdisc format.

3.6 Adaptation Requirements

There are no specific adaptation-related requirements for US NDC Phase 2.

3.7 Safety requirements

3.7.1 Toxic Products and Hazardous Materials

P2SSS311 The US NDC shall be composed of COTS hardware that does not require the use of toxic products or hazardous materials during normal operation or preventive maintenance tasks.

P2SSS442 The US NDC Training System shall be composed of COTS hardware that does not require the use of toxic products or hazardous materials during normal operation or preventive maintenance tasks.

3.7.2 Volatile Organic Compounds (VOCs)

P2SSS312 The US NDC shall be composed of COTS hardware that does not contain volatile organic compounds (VOCs), or require the use of VOCs for normal operation or to perform preventive maintenance procedures.

P2SSS443 The US NDC Training System shall be composed of COTS hardware that does not contain volatile organic compounds (VOCs), or require the use of VOCs for normal operation or to perform preventive maintenance procedures.

3.8 Security and Privacy Requirements

This section contains requirements related to security. Many of these requirements apply to both the Headquarters System and the Training System and will be mapped to both SRD requirements where applicable.

3.8.1 Security Procedures

P2SSS313 The US NDC shall acquire, process and store data up to the Department of Defense (DoD) Secret level in accordance with (IAW) DAA approved Air Force Manual 33-229, 1 November 1997, Controlled Access Protection (CAP) for Information Security Systems (IS).

P2SSS314 The US NDC shall be connected to external interfaces by way of an AFTAC provided firewall to protect it from external access by unauthorized personnel.

P2SSS315 The US NDC shall verify user identity prior to gaining access to the US NDC.

P2SSS316 The US NDC shall prevent the inadvertent disclosure of information to unauthorized users by protecting primary storage, fixed media, removable media, etc. IAW the object reuse requirements of the CAP for IS systems.

P2SSS317 The US NDC shall segregate configuration files containing classified or sensitive information into clearly marked directories.

P2SSS437 The US NDC Training System shall acquire, process, and store data up to the DoD Secret level in accordance with CAP procedure established by the US Air Force for legacy based IS.

P2SSS473 The US NDC Training System shall verify user identity prior to gaining access to the Training System.

P2SSS474 The US NDC Training System shall prevent the inadvertent disclosure of information to unauthorized users by protecting primary storage, fixed media, removable media, etc. IAW the object reuse requirements of the DAA approved Air Force Manual 33-229, 1 November 1997, CAP for IS systems.

3.8.2 Security Architecture

P2SSS318 The US NDC shall comply with security standards IAW the CAP for legacy systems.

P2SSS319 The US NDC shall employ security measures to prevent files containing classified information from being transmitted to the unclassified subsystem.

P2SSS320 The US NDC shall limit remote system access to specific authorized lists of users on specific authorized machines IAW the discretionary access procedures established in the CAP.

P2SSS321 The US NDC shall protect the integrity of data from unauthorized modification.

P2SSS322 The US NDC shall provide dependable audit capabilities that have the ability to selectively acquire and support tracing events to specific users.

P2SSS323 The US NDC shall require identification and authentication of all users attempting to log on to the system IAW the CAP for legacy systems.

P2SSS324 The US NDC shall provide warning banners advising users of system monitoring activities prior to completion of user login as part of the CAP auditing functionality.

P2SSS325 The US NDC shall provide one-way data flow from the unclassified to the classified subsystem.

P2SSS326 The US NDC shall provide system security protection for all message transfers from the classified to the unclassified subsystem.

P2SSS475 The US NDC Training System shall comply with security standards IAW the CAP.

P2SSS476 The US NDC Training System shall protect the integrity of data from unauthorized modification.

P2SSS477 The US NDC Training System shall provide dependable audit capabilities that have the ability to selectively acquire and support tracing events to specific users.

P2SSS479 The US NDC Training System shall require identification and authentication of all users attempting to log on to the system IAW the CAP for legacy systems.

P2SSS480 The US NDC Training System shall provide warning banners advising users of system monitoring activities prior to completion of user login as part of the CAP auditing functionality.

P2SSS472 The US NDC Training System shall limit system access to specific authorized lists of users on specific authorized machines IAW the discretionary access procedures established in the CAP.

P2SSS509 The US NDC shall have its low-to-high data transfer mechanism enhanced to include new data application protocols and it shall meet the security requirements of the Defense Information Systems Agency Multi-level Security Office (DISA/MLS).

P2SSS536 The US NDC data transfer mechanism shall meet the security requirements of the Defense Information Systems Agency Multi-level Security Office (DISA/MLS).

3.9 System Environment Requirements

3.9.1 Operating Environment

P2SSS327 The hardware components of the US NDC shall provide hardware capable of operating with 110-120/220-240 volts AC, 60 Hz, single/three phase power.

P2SSS328 The US NDC shall operate from the facility uninterruptible power supply (UPS) system to protect the COTS hardware from damaging voltage irregularities and power loss.

P2SSS329 The US NDC shall provide hardware components specified to operate within the temperature range of 60 to 90 degrees Fahrenheit.

P2SSS330 The US NDC hardware components shall be specified to operate within the relative humidity range of 20% to 80%, non-condensing.

P2SSS332 The US NDC shall provide hardware components specified to produce no more than 85db acoustic noise while operating.

P2SSS436 The US NDC Training System shall operate at an acoustic noise level of less than 85 decibels.

P2SSS451 The US NDC Training System shall have hardware capable of operating with 110-120/220-240 volts AC, 60 Hz, single/three phase power.

P2SSS519 The US NDC Training System shall operate from an uninterruptible power supply (UPS) system to protect the COTS hardware from damaging voltage irregularities and power loss.

P2SSS452 The US NDC Training System shall provide hardware components specified to operate within the temperature range of 60 to 90 degrees Fahrenheit.

P2SSS453 The US NDC Training System components shall be specified to operate within the relative humidity range of 20% to 80%, non-condensing.

3.9.2 Orderly Shutdown and Restart

P2SSS333 The US NDC shall provide the functions to perform orderly shutdown and startup.

P2SSS334 The US NDC shall provide functionality to restart each workstation individually without affecting the operation of other workstations in the system.

P2SSS520 The US NDC Training System shall provide functionality to restart each workstation individually without affecting the operation of other workstations in the system.

3.9.3 Protection of Hardware

P2SSS335 The US NDC hardware elements shall meet commercial standards for electrostatic discharge.

P2SSS336 The US NDC computer hardware shall comply with Part 15 of the Federal Communications Commission (FCC) rules for Class A or Class B digital devices.

P2SSS454 The US NDC Training System hardware elements shall meet commercial standards for electrostatic discharge.

P2SSS455 The US NDC Training System computer hardware shall comply with Part 15 of the Federal Communications Commission (FCC) rules for Class A or Class B digital devices.

3.10 Computer Resource Requirements

3.10.1 Computer Hardware Requirements

P2SSS337 The US NDC shall be constructed using COTS hardware.

P2SSS468 The US NDC shall provide functionality to produce high quality, black-and-white and color, hard copy reports and graphical output.

3.10.1.1 Training System Computer Hardware Requirements

P2SSS338 The US NDC Training System shall utilize hardware functionally compatible with the US NDC system.

P2SSS413 The US NDC Training System shall be equipped with an in-line uninterruptable power supply function that provided a minimum of 30 minutes of backup power.

P2SSS340 The US NDC Training System shall provide a workstation for the instructor.

P2SSS341 The US NDC Training System shall provide workstations to accommodate six (6) students.

P2SSS342 The US NDC Training System shall provide functionality to produce high quality, black-and-white and color, hard copy reports and graphical output.

P2SSS343 The US NDC Training System shall use interchangeable workstations and LRUs for items replicated in the training system.

P2SSS344 The US NDC Training System shall provide functionality to perform an orderly startup and shutdown.

P2SSS345 The US NDC Training System shall provide functionality to automatically shutdown prior to losing backup power from a UPS.

3.10.2 Computer Hardware Resource Utilization Requirements

3.10.2.1 Data Storage Requirements

3.10.2.1.1 On-line Storage

The US NDC provides users and processes immediate access to recently acquired waveform data through on-line storage. Data up to 180 days old are considered recently acquired and are subdivided into two storage classes, short-term and long-term. Differences between storage classes on the two subsystems are due to distinct requirements levied on both. The Unclassified Subsystem must account for site outages. A 13-day on-line short-term storage allows the US NDC to backfill data due to these outages prior to transitioning the data to long-term storage. The Classified Subsystem must provide processing algorithms immediate access to waveform data that are received from the Unclassified Subsystem and from classified stations. Additionally, analysts must have access to data that are recently acquired and processed. A 45-day short-term storage functionality provides this access.

3.10.2.1.1.1 Short-term Storage

The US NDC Unclassified Subsystem short-term storage contains data less than 13 days old; the Classified Subsystem short-term storage consists of data less than 45 days old.

P2SSS346 The US NDC unclassified subsystem shall have the capacity to store waveform data as characterized in Table 1 for up to 13 days in on-line short-term storage.

P2SSS347 The US NDC shall provide system-level access to all waveform data in on-line short-term storage with latency to first data accessed, of less than five seconds.

P2SSS348 The US NDC shall transfer waveform data from on-line short-term storage at a rate of at least 500 kilobytes per second.

P2SSS349 The US NDC classified subsystem shall have the capacity to store waveform data characterized in Table 1 for at least 45 days in on-line short-term storage.

3.10.2.1.1.2 Long-term Storage

The US NDC Unclassified Subsystem long-term storage contains data up to 180 days old; the Classified Subsystem long-term storage contains data between 45 and 180 days old.

P2SSS350 The US NDC unclassified subsystem shall have the capacity to store waveform data as characterized in Table 1 for at least 180 days in on-line long-term storage.

P2SSS351 The US NDC classified subsystem shall have the capacity to store waveform data as characterized in Table 1 for at least 60 days in on-line long-term storage.

P2SSS352 The US NDC shall provide access to waveform data in on-line long-term storage with a latency, to first data accessed, of less than one hour.

P2SSS353 The US NDC shall transfer waveform data from long-term storage at a rate of at least 500 kilobytes per second.

P2SSS510 The US NDC permanent storage system shall not rely on a proprietary database management system for access.

3.10.2.1.2 Off-line Storage

Off-line or permanent storage consists of waveform data that are greater than 180 days old from their origination date. Permanent storage only occurs on the US NDC Classified Subsystem, since the Classified Subsystem receives all data received on the Unclassified Subsystem plus data received from classified stations.

P2SSS354 The US NDC shall provide access to waveform data in off-line permanent storage with a latency, to first data accessed, of less than one hour from the time the tape is loaded onto the system.

P2SSS355 The US NDC shall transfer waveform data from off-line permanent storage at a rate of at least 500 kilobytes per second.

P2SSS356 The US NDC classified subsystem shall have the capacity to store waveform data characterized in Table 1 and associated waveform descriptor records over 180 days old for the life of the system in off-line permanent storage.

P2SSS357 The US NDC shall store all waveform and alphanumeric data on portable permanent storage media.

P2SSS535 The US NDC shall use a flat-file format for permanent storage.

3.10.2.1.3 Buffered Storage

P2SSS358 The US NDC unclassified subsystem shall have the capacity to buffer at least 8 hours of all incoming waveform data, as characterized in Table 1.

P2SSS359 The US NDC classified subsystem shall have the capacity to buffer at least 8 hours of all incoming waveform data, as characterized in Table 1.

3.10.2.1.4 Physical Data Storage

P2SSS360 The US NDC shall use storage media that has a minimum 10-year shelf life.

3.10.2.2 Database Storage

The Phase 2 US NDC Database Management System (DBMS) and associated hardware must be capable of storing all processing results.

P2SSS361 The US NDC unclassified subsystem shall have a database with the table space capacity to store 180 days of alphanumeric wfdisc records on-line.

P2SSS362 The US NDC unclassified subsystem database shall have the table space capacity to store 180 days of alphanumeric IDC bulletin data on-line.

P2SSS363 The US NDC classified subsystem shall have a database with the table space capacity to store all alphanumeric data processing and analysis records on-line for the life of the system.

P2SSS364 The US NDC shall provide functionality to store all data processing results off-line.

3.10.2.3 Training System Computer Hardware Resource Utilization Requirements

P2SSS460 The US NDC Training System shall provide on-line storage capacity for at least fifteen (15) 24 hour days of waveform data for all stations characterized in Table 1. Use of existing storage hardware and its capacity of 18GB per day is acceptable.

P2SSS366 The US NDC Training System shall make waveform data on-line and accessible to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.

P2SSS368 The US NDC Training System shall make alphanumeric data available to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.

P2SSS369 The US NDC Training System shall automatically backup all derived waveform and alphanumeric data once daily to offline storage.

P2SSS370 The US NDC Training System shall restore data from an offline backup.

P2SSS371 The US NDC Training System shall provide functionality to ensure data storage integrity of all data.

P2SSS486 The US NDC Training System shall provide on-line storage capacity for at least 15 days of seismic and hydroacoustic alphanumeric data from the US NDC under nominal loading. Use of existing storage hardware and its capacity of 18GB per day is acceptable.

3.10.3 Computer Software Requirements

3.10.3.1 General Software

P2SSS372 The US NDC software shall be written in high order programming languages, minimizing the number of languages.

P2SSS373 The US NDC shall make maximum use of COTS and Government off the Shelf (GOTS) software.

P2SSS456 The US NDC Training System shall be written in high order programming languages, minimizing the number of languages.

P2SSS482 The US NDC Training System shall make maximum use of COTS and Government off the Shelf (GOTS) software.

3.10.3.2 User Interface

P2SSS374 The US NDC shall have software with a uniform and consistent user interface for access to all the interactive processing functionality within the US NDC.

P2SSS457 The US NDC Training System shall have software with a uniform and consistent user interface for access to all the interactive processing functionality within the Training System.

3.10.3.3 Database

P2SSS375 The US NDC shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the US NDC without interruptions.

P2SSS458 The US NDC Training System shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the Training System without interruptions.

P2SSS376 The US NDC shall incorporate the Oracle Server Enterprise Edition product, version 8.1.7.

P2SSS493 The US NDC databases shall employ appropriate techniques (for example, check constraints or triggers) to prevent the entry of out-of-range data.

P2SSS495 The US NDC databases shall prevent the entry of duplicate data records.

P2SSS496 The US NDC databases shall enforce parent-child relationships between tables where appropriate.

P2SSS529 The US NDC databases shall prevent entry of data records into child tables unless the appropriate matching records exist in the parent tables.

P2SSS530 The US NDC shall ensure that related records in child tables are deleted whenever records in parent tables are deleted.

P2SSS531 Attempts by US NDC applications software to enter duplicate data records, invalid child records or out-of-range data into the US NDC databases shall be logged to application level log files.

P2SSS526 The US NDC databases shall prevent entry of data records into child tables unless the appropriate matching records exist in the parent tables.

P2SSS527 The US NDC databases shall ensure that related records in child tables are deleted whenever records in parent tables are deleted.

P2SSS528 Attempts by US NDC applications software to enter duplicate data records, invalid child records or out-of-range data into the US NDC databases shall be logged to application level log files.

P2SSS497 Users of US NDC databases shall be granted privileges appropriate to their level of access by means of pre-defined roles.

P2SSS498 The US NDC Oracle databases shall implement session-level temporary tables where appropriate.

3.10.3.4 Distributed Processing

P2SSS377 The US NDC shall provide a COTS distributed processing system to manage distributed processes.

3.10.3.5 Training System Computer Software Requirements

P2SSS378 The US NDC Training System shall provide software required for database management of student accounts.

P2SSS379 The US NDC Training System shall utilize software compatible with the US NDC.

3.10.4 Computer Communications Requirements

P2SSS380 The US NDC shall be partitioned into discrete subsystems that are connected through a local area network (LAN).

P2SSS503 The US NDC shall include an Operational subsystem LAN.

P2SSS504 The US NDC shall include a Developmental subsystem LAN.

P2SSS505 The US NDC shall include a Sustainment subsystem LAN.

P2SSS506 The US NDC Sustainment LAN shall be configured to allow development and testing of sustainment activities associated with the Operational subsystem.

P2SSS507 The US NDC shall provide a separate and distinct Training subsystem LAN.

P2SSS508 The US NDC Sustainment subsystem shall be fully functionally redundant to the Operational subsystem with the exception of shared archive components and data feeds.

3.11 System Quality Factors

US NDC Phase 2 will have system quality factors integrated into all of its design. This effort will produce a US NDC system, which meets all system level requirements over its intended life cycle. The system quality factors will include reliability, maintainability, and availability, and

will be used as system engineering design parameters during the development process. The following definitions are applicable for this section:

- Mean Time Between Critical Failures (MTBCF) is the average time between mission critical hardware failures for the Phase 2 mission critical hardware (MCH)
- MCH is hardware whose failure can significantly affect US NDC Phase 2 hardware availability, mission success, safety, or total maintenance and logistics support cost. MCH will be identified on the US NDC Phase 2 PPL.
- Mean Restoral Time (MRT) is the average time to restore US NDC Phase 2 to an operational condition and includes notification, response, supply, administration, and maintenance times
- Mean Time to Repair (MTTR): The average time to repair the Phase 2 US NDC to an operational condition and includes maintenance tasks for location, isolation, disassembly, interchange, reassembly, and check out
- Availability is defined as $MTBCF/(MTBCF + MRT)$
- Line Replaceable Unit (LRU) is an assembly, unit, subassembly, or part which is intended to be replaced on-site during normal corrective maintenance. For US NDC Phase 2, the LRU level is defined by the sustainment maintenance support agreement
- Automatic fault isolation is defined as that functionality provided in the COTS hardware/software
- Interactive troubleshooting is defined as labor actions dedicated to localizing and isolating faults using best practices IAW the COTS Field Engineering Handbook, appropriate Technical Instructions (TIs), Integrated Logistics Support Plan (ILSP), PPL, and system drawings
- System outage is defined as the nonfunctional state of the US NDC due to failure(s) (hardware, software, and/or human) which prevent the US NDC from performing its mission

3.11.1 Reliability

P2SSS381 The US NDC shall have a hardware mission MTBCF of no less than 2160 hours when operating in an environment specified in Section 3.9 of this document. The MTBCF parameter is based on MCH.

P2SSS382 The US NDC shall have a mission profile of operating 52 weeks per year, 7 days per week and 24 hours per day.

3.11.2 Maintainability

P2SSS383 The US NDC hardware MRT shall be 21.8 hours. The MRT parameter is based on MCH.

P2SSS384 The US NDC shall have a hardware MTTR of less than two hours at the 95th percentile.

P2SSS385 The US NDC shall be designed for organizational and depot levels of maintenance.

P2SSS386 The US NDC shall provide functionality to automatically monitor, collect, and report fault information.

P2SSS387 The US NDC shall achieve a minimum time between preventive maintenance routines (PMRs) of 720 hours.

P2SSS388 The US NDC shall not have system outages due to PMRs.

P2SSS389 The US NDC COTS hardware selection shall consider fault detection and isolation capabilities to maximize MCH failure detection and reporting.

P2SSS390 The US NDC shall detect and report the loss of a storage device.

P2SSS521 The US NDC shall support the use of an alternate storage device to allow for continued system operations in the event of a storage device failure.

P2SSS391 The US NDC shall maximize the use of storage devices (controller modules, disk trays, drives, etc.) that have the capabilities of automatic failover and hot spare.

P2SSS392 The US NDC shall allow for data recovery in the event of storage device failure.

P2SSS393 All US NDC detected hardware faults shall be isolated to one LRU as directed by the COTS Field Engineering Handbook for the given hardware system using a combination of automatic fault isolation and interactive troubleshooting.

P2SSS394 The US NDC shall be designed to enable LRU removal, replacement, and reinstallation within one hour.

P2SSS395 A sparing analysis shall be conducted after CDR by a joint Government and Contractor team. MCH will be evaluated for suitable sparing levels to support mission availability requirements.

P2SSS396 The US NDC data storage function shall be designed so that individual storage devices may be removed and replaced without loss of data or system integrity.

P2SSS397 The US NDC repair time for MCH failures shall not exceed 4 hours.

P2SSS398 The US NDC shall maximize the use of interchangeable workstations, LRUs and other interchangeable hardware.

3.11.3 Availability

A critical failure implies that a portion of the US NDC hardware and/or software is unable to collect or process required data. A critical failure for the US NDC occurs when any of the following situations occur due to failure of US NDC hardware and/or software:

- The inability to continuously process data from any sensor station identified as essential to monitoring within one hour of data acquisition at the US NDC.
- The inability to continuously acquire data from US territorial stations identified in the CTBT with 98% data accuracy and, within 15 minutes of acquiring the data at the US NDC, forward it to the IDC.
- The inability to continuously acquire data from US territorial stations identified in the CTBT with 97% data timeliness and, within 5 minutes of data acquisition at the US NDC, forward it to the IDC.
- The inability of the Spotlight and Forward processing pipelines to identify and report an event within one hour of data acquisition at the US NDC.

P2SSS399 The US NDC shall provide a minimum operational availability of 99%.

3.12.4 Training System Quality Requirements

P2SSS400 The US NDC Training System shall support mission duration of 8 hours per day, 5 days per week, 250 days per year.

P2SSS401 The US NDC Training System shall provide a minimum MTBCF of 1500 hours. A critical failure is defined as a failure that requires longer than 2 hours to repair.

P2SSS402 The US NDC Training System shall provide an MTTR of less than 2 hours for 95% of repairs.

P2SSS403 The US NDC Training System shall include the functionality to isolate all faults to one LRU using a combination of fault isolation and interactive troubleshooting procedures contained in system documentation.

P2SSS404 The US NDC Training System shall support the use of an alternate storage device to allow for continued system operations in the event of a storage device failure.

P2SSS405 The US NDC Training System shall be designed to enable LRU removal, replacement, and reinstallation within one hour.

P2SSS406 The US NDC Training System data storage function shall be designed so that individual storage devices may be removed and replaced without loss of data or system integrity.

P2SSS407 The US NDC Training System shall be designed for a two-level (organizational and depot) maintenance concept.

P2SSS408 The US NDC Training System shall provide a minimum time between PMRs of 720 hours.

P2SSS409 The US NDC Training System shall provide system documentation appropriate for the organizational and depot maintenance levels.

3.12 Design and Construction Constraints

P2SSS533 The US NDC shall use Tuxedo Distributed Application Control Software (DACS) for distributed processing.

P2SSS410 The US NDC shall be designed to have its hardware and software incrementally upgraded over its operational lifetime, including the ability to add functionality, increase processing capacity, and increase memory storage capacity without unplanned loss of previous capabilities.

P2SSS502 The US NDC hardware purchased after Phase 2 Build 1 CDR shall have a 5-year service life from the conclusion of Phase 2 Build 1 SAT.

P2SSS459 The US NDC Training System shall be designed to have its hardware and software incrementally upgraded over its operational lifetime, including the ability to add functionality, increase processing capacity, and increase memory storage capacity without unplanned loss of previous capabilities.

3.13 Personnel-related Requirements

There are no specific personnel-related requirements for US NDC Phase 2 Build 1.

3.14 Training-related Requirements

There are no specific training-related requirements for US NDC Phase 2 Build 1.

3.15 Logistics-related Requirements

Specific logistics-related requirements for US NDC Phase 2 are described in the US NDC Phase 2 Statement of Work (SOW).

3.16 Other Requirements

There are no specific other requirements for US NDC Phase 2 Build 1.

3.17 Packaging Requirements

There are no specific packaging-related requirements for US NDC Phase 2 Build 1.

3.18 Precedence and Criticality of Requirements

There is no specific precedence or criticality of requirements for US NDC Phase 2 Build 1.

4. Qualification Provisions

Table 5 provides the qualification methods for each specification. The qualification methods are one or more of the following:

- **Demonstration (D):** Verification by demonstration that a requirement is met is based on observing the performance of the software or hardware, where specific inputs have an expected result, when the software is executed on the hardware according to the test procedure.
- **Inspection (I):** Verification by inspection that a requirement is met involves personal examination of hardware, source code, parameter files, and/or other physical manifestations of the software, such as software-generated printouts and diagrams. This technique uses observation/examination of some entity to establish conformity with requirements without the need for analysis, demonstration, or test. Inspection does not involve execution of the software.
- **Test (T):** Verification by testing that a requirement is met is based on exercising the software or hardware with pre-determined inputs and then recording and analyzing the measurable response to particular stimuli. This technique involves measurements or quantitative observations of the performance of a function or equipment. The software or hardware requirement is verified by comparison with quantitative criteria such as predicted values, range of values, accuracies, or tolerances.
- **Analysis (A):** Verification by analysis that a requirement is met is based on inference from an examination and analysis of the internal structure of the software and its components. This may be required when a software requirement cannot be directly tested and observed. This technique may require a review or study of the data, mathematical expressions, or software models.

Table 5. Qualification Method

REQUIREMENTS	QUALIFICATION METHOD
P2SSS2: The US NDC shall provide interactive functionality to execute all automated data acquisition, data processing, and data storage functions.	D
P2SSS3: The US NDC shall provide functionality to initiate and interrupt all automated processing tasks on the system from a controlled interface.	D
P2SSS4: The US NDC shall be able to automatically initiate processing based on configurable criteria including, as a minimum, time, availability of data, and completion of prior processing steps.	T
P2SSS5: The US NDC shall control sequencing of multiple processes so dependent processes are executed in sequential or parallel paths.	D
P2SSS6: The US NDC shall provide configurable sequencing for processes, and shall support rule-based processing of sequential tasks such that the success or failure of one task can initiate another task.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS7: The US NDC shall provide status for all automated processes.	I
P2SSS8: The US NDC shall provide logging for all automated processes.	I
P2SSS9: The US NDC shall provide a common interface for the review of all logs.	D
P2SSS10: The US NDC shall provide functionality to automatically and immediately notify users at the System Operations Manager (SOM) and Data Acquisition Manager (DAM) consoles of the failure of any individual process.	T
P2SSS11: The US NDC shall acquire waveform data in the format outlined in section 3.3.2 of this document.	D
P2SSS12: The US NDC shall automatically acquire unprocessed waveform data at the capacity characterized in Table 1.	I
P2SSS13: The US NDC shall acquire and validate authenticated data using SDAS OMS software. (Deferred)	I
P2SSS14: The US NDC shall monitor remote field stations.	D
P2SSS15: The US NDC shall provide a continuous display of all seismic, hydroacoustic, and infrasonic station and sensor status.	D
P2SSS16: The US NDC shall provide a GUI to continuously display unprocessed waveforms.	D
P2SSS17: The US NDC shall provide a GUI to continuously monitor communications between the US NDC and external sites.	D
P2SSS18: The US NDC shall provide a GUI to continuously monitor remote seismic, hydroacoustic and infrasonic field sensors and digitizers.	D
P2SSS19: The US NDC shall provide a GUI to continuously monitor radionuclide stations.	D
P2SSS20: The US NDC shall calibrate and control remote field stations. (Deferred)	D
P2SSS21: The US NDC shall transmit calibration and control signals to all AFTAC-controlled sensor stations listed in the US NDC NDDOC dated April 2001. (Deferred)	D
P2SSS22: The US NDC shall provide a GUI to perform maintenance tasks associated with field site calibration, analysis, diagnostics, and communications. (Deferred)	D
P2SSS23: The US NDC shall remotely command, control, configure, and reconfigure, seismic hydroacoustic, and infrasonic field equipment. (Deferred)	D
P2SSS24: The US NDC shall provide a GUI that displays calibration analysis results from seismic, hydroacoustic, and infrasonic sites. (Deferred)	D
P2SSS25: The US NDC shall automatically update sensor calibration results for seismic, hydroacoustic, and infrasonic sites, provided the results are available in the protocol. (Deferred)	D
P2SSS26: The US NDC shall automatically update sensor calibration information for seismic, hydroacoustic, and infrasonic sites. (Deferred)	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS27: The US NDC shall provide a GUI that displays frequency, amplitude, and phase response values for each seismic, hydroacoustic, and infrasonic site. (Deferred)	D
P2SSS28: The US NDC shall store frequency, amplitude, and phase response values for each seismic, hydroacoustic, and infrasonic site acquired at the US NDC. (Deferred)	A
P2SSS29: The US NDC shall automatically acquire all IDC waveform availability data in alphanumeric format within one hour of the IDC making the data available to the NDC.	I
P2SSS31: The US NDC shall automatically acquire all USGS alphanumeric bulletin products in alphanumeric format within one hour of the USGS making the data available to the NDC.	I
P2SSS32: The US NDC shall acquire ancillary data available in CD 1.0 and 1.1 frames, from sensor sites.	I
P2SSS33: The US NDC shall provide a comprehensive GUI that displays ancillary data from sensor sites. The GUI will be integrated with station and sensor status displays. (Deferred)	D
P2SSS34: The US NDC shall ensure data integrity through data acquisition statistics tracked on an individual channel basis as a function of time for seismic, hydroacoustic, and infrasonic waveform data. (Deferred)	I, D
P2SSS35: The US NDC data acquisition statistics shall track latency, gaps, and zero fills in data acquired at the US NDC unclassified and classified subsystems' front-end, and data acquired on the US NDC classified subsystem from the US NDC unclassified subsystem. (Deferred)	I, D
P2SSS36: The US NDC shall track station connections to the US NDC unclassified and classified subsystems' front-end.	D
P2SSS37: The US NDC shall distinguish between missing and incomplete waveform data if supported by the data transfer protocol.	T
P2SSS38: The US NDC shall automatically monitor the timing of acquired waveform data intervals by measuring the latency time between data recorded at the sensor and acquired at the front-end of the US NDC by using McTool, WorkFlow, and PerfMon.	I
P2SSS39: The US NDC shall automatically monitor and log missing waveform data.	I, D
P2SSS40: The US NDC unclassified subsystem shall automatically forward all acquired waveform data to the classified subsystem within 60 seconds of receiving the data at the unclassified US NDC front-end.	T
P2SSS41: The US NDC shall automatically forward data, within 60 seconds of acquiring the data from US territorial stations identified in the Comprehensive Test Ban Treaty (CTBT), to the IDC.	D
P2SSS42: The US NDC shall verify 100% of the available waveform data in the source buffers has transferred entirely and correctly to the destination buffers prior to any deletion command being given to the source buffers.	I

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS43: The US NDC classified subsystem shall automatically generate a bulletin requesting re-transmission of corrupt and missing data from the unclassified subsystem. Missing/corrupt frames will be added to the bulleting when they are 60 seconds past-due (based on time of receipt of adjacent frames). Missing/corrupt frames will be removed from the bulleting as they arrive, or when more than ten days past-due.	I, T
P2SSS44: The US NDC classified subsystem shall continuously perform Global processing.	D
P2SSS45: The US NDC classified subsystem shall automatically produce a Global bulletin using seismic and hydroacoustic stations, the latter being included with the hydroacoustic associations being added and seismic events relocated through Event-Driven Processing (EDP).	D
P2SSS46: The US NDC classified subsystem shall process and interpret teleseismic and regional seismic data during Global processing.	D
P2SSS47: The US NDC classified subsystem shall provide the capacity to simultaneously support up to two Broad Area processing regions within the Global processing pipeline.	I
P2SSS48: The US NDC classified subsystem shall provide initial Global processing results within 60 minutes of receipt of the seismic waveform data.	D
P2SSS49: The US NDC classified subsystem shall provide functionality to execute a Spotlight processing pipeline concentrating on specific source regions.	D
P2SSS50: The US NDC classified subsystem shall provide the capacity to support up to eight Spotlight regions as provided by GFE.	A
P2SSS51: The US NDC classified subsystem shall provide the capacity to perform Spotlight processing using up to eight seismic stations per Spotlight area as provided by GFE.	I
P2SSS52: The US NDC classified subsystem shall provide initial results of Spotlight processing within 30 minutes of the seismic waveform data becoming available.	D
P2SSS53: The US NDC classified subsystem shall support Spotlight regions as large as 1,000,000 square-km as provided by GFE.	I
P2SSS54: The US NDC classified subsystem shall provide functionality to configure Spotlight processing to suit the regions of interest.	D
P2SSS55: The US NDC classified subsystem shall provide functionality to execute a Forward processing pipeline concentrating on specific source regions.	D
P2SSS56: The US NDC classified subsystem shall provide the capacity to support up to ten Forward processing regions simultaneously.	A
P2SSS57: The US NDC classified subsystem shall provide the capacity to perform Forward processing using up to ten seismic stations per Forward processing region.	I
P2SSS58: The US NDC classified subsystem shall provide initial results of Forward processing within ten minutes of the seismic waveform data becoming available.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS59: The US NDC classified subsystem shall notify system operators immediately upon formation of an event in the Forward processing pipeline.	D
P2SSS60: The US NDC classified subsystem shall support Forward processing regions as large as 160,000 square-km.	I
P2SSS61: The US NDC classified subsystem shall provide the functionality to configure the data processing and display parameters on a station-by-station basis to suit the regions of interest within the Forward processing pipeline.	D
P2SSS62: The US NDC classified subsystem shall provide functionality to reprocess data in a limited time window using a Backward processing pipeline.	D
P2SSS63: The US NDC classified subsystem shall provide the capacity to perform Backward processing for up to two selected regions simultaneously.	I
P2SSS64: The US NDC classified subsystem shall provide temporary storage for Backward processing equivalent to 12 weeks of alphanumeric results from Global processing.	I
P2SSS65: The US NDC classified subsystem shall provide the capacity to store up to 48 hours of waveform data from the Global processing network in support of Backward processing.	A
P2SSS66: The US NDC classified subsystem shall provide functionality to configure Backward processing to suit the regions of interest.	D
P2SSS67: The US NDC classified subsystem shall provide Backward processing results within one minute of completion of processing.	D
P2SSS68: The US NDC classified subsystem shall perform detection processing on continuous data from seismic stations.	D
P2SSS69: The US NDC classified subsystem shall perform seismic detection processing on data intervals at least two minutes in duration.	D
P2SSS70: The US NDC classified subsystem shall automatically apply detection processing to late-arriving data.	D
P2SSS71: The US NDC classified subsystem shall perform detection processing on continuous data from hydroacoustic stations.	D
P2SSS72: The US NDC classified subsystem shall perform hydroacoustic detection processing on data intervals at least ten minutes in duration.	D
P2SSS73: The US NDC classified subsystem shall provide the capacity to process up to 55 hydroacoustic channels at a sample rate of 250 samples per second in the Global pipeline.	A
P2SSS74: The US NDC classified subsystem shall provide functionality to configure detection processing parameters on a detector channel-by-detector channel basis.	D
P2SSS75: The US NDC classified subsystem shall provide functionality to configure detection processing parameters to focus on a specific source region.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS76: The US NDC classified subsystem shall obtain site-specific station geometry from the database.	D
P2SSS77: The US NDC classified subsystem shall provide functionality to identify and repair single-point spikes in waveform data.	D
P2SSS78: The US NDC classified subsystem shall provide functionality to identify and mark data gaps in waveform data.	D
P2SSS79: The US NDC classified subsystem shall provide functionality to identify and remove array waveform channels with anomalous amplitudes.	D
P2SSS80: The US NDC classified subsystem shall provide functionality to mask data quality control problems that cannot be repaired.	D
P2SSS81: The US NDC classified subsystem shall provide functionality to demean input waveform segments.	D
P2SSS82: The US NDC classified subsystem shall provide functionality to determine data quality statistics automatically.	D
P2SSS83: The US NDC classified subsystem shall provide functionality to form coherent beams at array sites steered to a given azimuth and slowness prior to detection.	D
P2SSS84: The US NDC classified subsystem shall provide functionality to form incoherent beams at array sites steered to a given azimuth and slowness prior to detection.	D
P2SSS85: The US NDC classified subsystem shall provide functionality to filter raw channels or beams using Butterworth IIR filters prior to detection.	D
P2SSS86: The US NDC classified subsystem shall provide functionality to detect signals using the STA/LTA detector.	D
P2SSS87: The US NDC classified subsystem shall provide functionality to detect signals using the Z detector.	D
P2SSS88: The US NDC classified subsystem shall provide functionality to detect signals using the log-Z detector.	D
P2SSS89: The US NDC classified subsystem shall provide functionality to detect signals using the auto-regressive detector as provided by GFE.	D
P2SSS90: The US NDC classified subsystem shall provide functionality to detect signals using the F-statistic detector as provided by GFE.	D
P2SSS91: The US NDC classified subsystem shall provide functionality to detect signals using the waveform correlation detector as provided by GFE, if this Phase 1 Upgrade capability is available prior to the Build 1 software baseline freeze.	D
P2SSS92: The US NDC classified subsystem shall provide functionality to allow insertion of new detector algorithms.	I
P2SSS93: The US NDC classified subsystem shall perform signal detection using detection thresholds approved by the Government.	I

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS94: The US NDC classified subsystem shall provide functionality to identify and cull signal detections occurring on multiple beams.	D
P2SSS95: The US NDC classified subsystem shall provide the capacity to store up to 60,000 detections per day stored online for the life of the system.	A
P2SSS96: The US NDC classified subsystem shall measure signal back-azimuth and slowness for detected phases at array stations using FK techniques.	D
P2SSS97: The US NDC classified subsystem shall determine the F-statistic and estimate uncertainties in measured azimuth and slowness obtained from FK analysis.	D
P2SSS98: The US NDC classified subsystem shall measure signal back-azimuth and slowness for P-type phases at three-component stations using polarization techniques.	D
P2SSS99: The US NDC classified subsystem shall estimate onset times of detecting short-period signals.	D
P2SSS100: The US NDC classified subsystem shall estimate the ratio of signal to noise amplitude for each detected signal.	D
P2SSS101: The US NDC classified subsystem shall estimate the dominant period of detected signals.	D
P2SSS102: The US NDC classified subsystem shall provide functionality to measure peak-to-trough amplitudes in user specified time windows.	D
P2SSS103: The US NDC classified subsystem shall provide functionality to measure amplitude in moving STA windows.	D
P2SSS104: The US NDC classified subsystem shall provide functionality to correct amplitude measurements for instrument response at the observed period.	D
P2SSS105: The US NDC classified subsystem shall estimate features from hydroacoustic signals as provided by GFE.	D
P2SSS106: The US NDC classified subsystem shall provide functionality to store a representative beam for each detection.	D
P2SSS107: The US NDC classified subsystem shall store data quality statistics, detection information and measured features for use by later processing.	D
P2SSS108: The US NDC classified subsystem shall automatically perform phase identification in each processing pipeline.	D
P2SSS109: The US NDC classified subsystem shall automatically group phases from common events in all processing pipelines.	D
P2SSS110: The US NDC classified subsystem shall automatically provide initial phase identification for each detected signal based upon measured features of that detection.	D
P2SSS111: The US NDC classified subsystem shall identify teleseismic phases.	D
P2SSS112: The US NDC classified subsystem shall automatically differentiate primary and secondary teleseismic phases.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS113: The US NDC classified subsystem shall provide functionality to automatically identify local and regional seismic P and S phases in selected regions.	D
P2SSS114: The US NDC classified subsystem shall automatically identify hydroacoustic H and T phases.	D
P2SSS115: The US NDC classified subsystem shall provide functionality to configure initial phase identification to use station-dependent methods.	I
P2SSS116: The US NDC classified subsystem shall automatically group teleseismic signals from a single station that emanates from the same event.	D
P2SSS117: The US NDC classified subsystem shall automatically group hydroacoustic signals from a single station that emanates from the same event.	D
P2SSS118: The US NDC classified subsystem shall automatically associate all signals from a network of seismic stations that emanate from the same event using travel-time prediction and signal features.	D
P2SSS119: The US NDC classified subsystem shall provide functionality to automatically refine phase identification after association to an event.	D
P2SSS120: The US NDC classified subsystem shall associate a given detection to no more than one event in a given pipeline.	D
P2SSS121: The US NDC classified subsystem shall provide functionality to automatically associate hydroacoustic phases to events formed using the seismic technique.	D
P2SSS122: The US NDC classified subsystem shall provide functionality to utilize the best path-dependent information available on the system during automatic association.	D
P2SSS123: The US NDC classified subsystem shall provide functionality to automatically associate detected signals with existing event hypotheses as those detections become available.	D
P2SSS124: The US NDC classified subsystem shall retain event hypotheses meeting configurable acceptance criteria.	D
P2SSS125: The US NDC classified subsystem shall provide functionality to automatically locate events using signal arrival time, back azimuth and slowness.	D
P2SSS126: The US NDC classified subsystem shall automatically locate all events satisfying configurable minimum-data criteria.	D
P2SSS127: The US NDC classified subsystem shall provide functionality to automatically locate events using seismic signals, hydroacoustic signals or combinations thereof.	D
P2SSS128: The US NDC classified subsystem shall automatically locate events at depth for events satisfying configurable criteria.	D
P2SSS129: The US NDC classified subsystem shall estimate uncertainties in all computed locations, including predicted data residuals.	D
P2SSS130: The US NDC classified subsystem shall provide functionality to use the best available information in the US NDC system for automatic location.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS131: The US NDC classified subsystem shall provide functionality to use travel-time correction surfaces and regional travel-time tables provided by GFE for automatic location.	D
P2SSS132: The US NDC classified subsystem shall automatically determine event magnitudes for all located events with sufficient amplitude measurements for the purpose of characterizing the event source.	D
P2SSS133: The US NDC classified subsystem shall automatically determine mb.	D
P2SSS134: The US NDC classified subsystem shall provide functionality to determine maximum-likelihood estimates of mb and Ms.	D
P2SSS135: The US NDC classified subsystem shall provide functionality to automatically determine regional magnitude in selected regions, as provided by GFE.	D
P2SSS136: The US NDC classified subsystem shall provide functionality to configure regional magnitude processing to selected regions of interest.	I
P2SSS137: The US NDC classified subsystem shall estimate the uncertainties of all computed magnitudes.	D
P2SSS138: The US NDC classified subsystem shall provide functionality to use the best available attenuation information in the US NDC system for automatic magnitude determination.	D
P2SSS139: The US NDC classified subsystem shall store the results of phase identification, association, location and magnitude estimation to be accessible by subsequent processes.	D
P2SSS140: The US NDC classified subsystem shall store origin beams and detection beams for associated detections for each event.	D
P2SSS141: The US NDC classified subsystem shall perform post-analysis event identification.	D
P2SSS142: The US NDC classified subsystem shall provide functionality to perform event identification in the Global processing pipeline.	D
P2SSS143: The US NDC classified subsystem shall classify events using teleseismic discriminants consistent with the rules given in "Event Classification Procedures for the Seismic Technique (REF 11)", dated 5 April 1982.	D
P2SSS144: The US NDC classified subsystem shall determine if an event is located within the Area-Of-Interest (AOI) and store that designation with other event information.	D
P2SSS145: The US NDC classified subsystem shall provide functionality to modify the AOI to meet changing mission objectives.	I
P2SSS146: The US NDC classified subsystem shall store the results of event identification with other event information for use by subsequent processing and analysis.	D
P2SSS147: The US NDC classified subsystem shall provide functionality to train neural networks for initial wave-type identification.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS148: The US NDC classified subsystem shall provide functionality to compute new Bayesian inference tables for regional phase identification from historical data.	D
P2SSS149: The US NDC classified subsystem shall provide functionality to create and view grid files used in automated network association.	D
P2SSS150: The US NDC classified subsystem shall provide documentation to assist in testing and understanding the functions and primary configuration parameters of the system used for automated network association.	D
P2SSS151: The US NDC classified subsystem shall provide functionality to review the results of all automatic processing.	D
P2SSS152: The US NDC classified subsystem shall provide interactive functionality to edit the results of all automatic processing.	D
P2SSS153: The US NDC classified subsystem shall provide interactive functionality to edit stored analysis results.	D
P2SSS154: The US NDC classified subsystem shall provide functionality to compare results of automatic processing to all analyzed results.	D
P2SSS155: The US NDC classified subsystem shall retain all original processing results when edited.	D
P2SSS156: The US NDC classified subsystem shall permit analysis of results without impact to automatic processing.	D
P2SSS157: The US NDC classified subsystem shall provide access to and the functionality to include all available data during analysis, including data not available at the time of previous processing.	D
P2SSS158: The US NDC classified subsystem shall store the results of each analysis stage.	D
P2SSS159: The US NDC classified subsystem shall provide functionality to automatically prepare origin beams for array sensor stations, in the predicted arrival time window and steered to an event, for display during analysis.	D
P2SSS160: The US NDC classified subsystem shall provide functionality to automatically determine hydroacoustic azimuths in preparation for analysis.	D
P2SSS161: The US NDC classified subsystem shall provide functionality to perform automatic processing between each stage of analysis.	D
P2SSS162: The US NDC classified subsystem shall provide functionality to display data for each waveform type individually by technique.	D
P2SSS163: The US NDC classified subsystem shall provide functionality to manipulate waveform data, including scrolling, zooming and filtering of the data.	D
P2SSS164: The US NDC classified subsystem shall provide functionality to edit any measurement used for location, magnitude or discriminant analysis.	D
P2SSS165: The US NDC classified subsystem shall provide functionality to modify phase identification of data used for event location.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS166: The US NDC classified subsystem shall provide interactive functionality to compute event location.	D
P2SSS167: The US NDC classified subsystem shall automatically compute, display, and save event location results for depth constrained to the surface of the earth, depth unconstrained, and a user-selected depth, and use the results in subsequent processing.	D
P2SSS168: The US NDC classified subsystem shall provide interactive functionality to select those data that are defining for event location.	D
P2SSS169: The US NDC classified subsystem shall provide functionality for specifying user-selected location parameters.	D
P2SSS170: The US NDC classified subsystem shall provide functionality to specify travel-time tables used for location.	D
P2SSS171: The US NDC classified subsystem shall provide functionality to select any available regionalized corrections to travel-times tables.	D
P2SSS172: The US NDC classified subsystem shall provide functionality to perform event location using test-site travel-time corrections.	D
P2SSS173: The US NDC classified subsystem shall provide interactive functionality to compute all event magnitudes used in the system.	D
P2SSS174: The US NDC classified subsystem shall provide interactive functionality to select those data that are defining for event magnitude, while preserving all individual station magnitudes.	D
P2SSS175: The US NDC classified subsystem shall provide interactive functionality to allow user selection of magnitude parameters.	D
P2SSS176: The US NDC classified subsystem shall provide functionality to specify attenuation tables used for magnitude.	D
P2SSS177: The US NDC classified subsystem shall provide functionality to compute magnitude using test-site magnitude corrections.	D
P2SSS178: The US NDC classified subsystem shall provide functionality to use all automatic processing algorithms during interactive analysis.	D
P2SSS179: The US NDC classified subsystem shall provide functionality to interactively generate origin and detection beams.	D
P2SSS180: The US NDC classified subsystem shall provide functionality to form beams for three-component data using polarization techniques.	D
P2SSS181: The US NDC classified subsystem shall provide functionality to modify detection beam parameters.	D
P2SSS182: The US NDC classified subsystem shall by default generate beams with parameters identical to those used in automatic processing.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS183: The US NDC classified subsystem shall provide interactive functionality to determine back azimuth and apparent velocity from array data using FK analysis.	D
P2SSS184: The US NDC classified subsystem shall provide functionality to modify parameters controlling FK analysis.	D
P2SSS185: The US NDC classified subsystem shall provide functionality to determine back azimuth and apparent velocity for P- and LR-type waves from three-component seismic stations using polarization analysis.	D
P2SSS186: The US NDC classified subsystem shall provide functionality to interactively review hydroacoustic azimuths determined in pre-analysis processing.	D
P2SSS187: The US NDC classified subsystem shall provide functionality to automatically perform event formation using user-selected detections.	D
P2SSS188: The US NDC classified subsystem shall provide functionality to automatically determine signal-to-noise ratios for analyst-added detections.	D
P2SSS189: The US NDC classified subsystem shall provide functionality for reviewing selected seismic discrimination results.	D
P2SSS190: The US NDC classified subsystem shall provide interactive functionality for selection of those data used in seismic discriminant analysis.	D
P2SSS191: The US NDC classified subsystem shall provide interactive functionality to modify discrimination results.	D
P2SSS192: The US NDC classified subsystem shall provide functionality for reviewing hydroacoustic discrimination results, as provided by GFE.	D
P2SSS193: The US NDC classified subsystem shall provide interactive functionality for selection of those data used in hydroacoustic discriminant analysis, as provided by GFE.	D
P2SSS194: The US NDC classified subsystem shall provide functionality to review the results of event identification.	D
P2SSS195: The US NDC classified subsystem shall provide functionality for user-selection of discriminants to be used in event identification.	D
P2SSS196: The US NDC classified subsystem shall provide functionality to automatically access, spatially manipulate, and spatially process geographically referenced information required for data processing provided by GFE.	D
P2SSS197: The US NDC classified subsystem shall provide functionality to store, manage, maintain, analyze, and manipulate spatial data as provided by GFE.	D
P2SSS198: The US NDC classified subsystem shall provide the functionality to maintain change control of geographical information in the system, including the history of data updates and modifications, as provided by GFE.	D
P2SSS199: The US NDC classified subsystem shall provide functionality to display and process geographical information as provided by GFE.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS200: The US NDC classified subsystem shall provide functionality to display event, detection and station information in conjunction with spatial data.	D
P2SSS201: The US NDC classified subsystem shall provide interactive functionality to manipulate and process spatial data as provided by GFE.	D
P2SSS202: The US NDC classified subsystem shall provide functionality to generate high quality graphical and tabular presentations of the results of spatial processing of geographical data as provided by GFE.	D
P2SSS203: The US NDC classified subsystem shall provide functionality to generate bulletins for all processing modes.	D
P2SSS204: The US NDC classified subsystem shall provide functionality to generate bulletins after all processing stages, in automated processing and in interactive analysis, that result in event forming.	D
P2SSS205: The US NDC classified subsystem shall provide functionality to generate event bulletins containing information about the network solution (latitude, longitude, time, depth, magnitude) and information about station associations.	D
P2SSS206: The US NDC classified subsystem shall perform comparisons between two bulletins that will identify common events and characterize the differences in their solutions.	D
P2SSS207: The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using event information.	D
P2SSS208: The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using both event and arrival information.	D
P2SSS209: The US NDC classified subsystem shall provide functionality to automatically monitor data processing functions.	D
P2SSS210: The US NDC classified subsystem shall provide functionality to interactively monitor data processing functions through a GUI.	D
P2SSS211: The US NDC classified subsystem shall provide functionality to evaluate the performance of data processing functions using specified metrics.	D
P2SSS212: The US NDC classified subsystem shall provide functionality to automatically generate performance monitoring reports as regularly scheduled products.	D
P2SSS213: The US NDC classified subsystem shall provide interactive functionality to generate performance monitoring reports.	D
P2SSS214: The US NDC classified subsystem shall provide functionality to automatically collect historical averages of station detection rates.	D
P2SSS215: The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical comparisons between stored results from any processing stage in any pipeline mode of the US NDC.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS216: The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical bulletin comparisons between stored results of the US NDC and other operational systems whose results are stored using the applicable version of the US NDC Database Schema.	D
P2SSS217: The US NDC classified subsystem shall provide functionality to generate graphical displays of bulletin comparisons, including event maps and graphs of location differences.	D
P2SSS218: The US NDC classified subsystem shall provide functionality to interactively customize performance monitoring reports, including selection of time windows and comparisons to include.	D
P2SSS219: The US NDC classified subsystem shall provide functionality to display in color a generated performance report.	D
P2SSS220: The US NDC classified subsystem shall provide functionality to generate color copies on paper and transparencies of a generated performance report.	D
P2SSS221: The US NDC classified subsystem shall provide functionality to monitor the timeliness of data acquisition and processing milestones on the classified subsystem.	D
P2SSS222: The US NDC classified subsystem shall provide functionality to monitor the availability of expected data on the classified subsystem, for stations that are processed.	D
P2SSS223: The US NDC classified subsystem shall provide functionality to monitor the quality of acquired data, including percentage of data masked due to spikes or drop-outs, and the number of masked segments, for stations that are processed.	D
P2SSS224: The US NDC classified subsystem shall provide functionality to monitor station noise levels for acquired data, for stations that are processed.	D
P2SSS225: The US NDC classified subsystem shall provide functionality to monitor station detection thresholds using Chi-square analysis.	D
P2SSS226: The US NDC classified subsystem shall provide functionality to monitor station detection rates.	D
P2SSS227: The US NDC classified subsystem shall provide functionality to monitor the rates of associated automated detections and of analyst-added phases.	D
P2SSS228: The US NDC classified subsystem shall provide functionality to monitor the accuracy of amplitude and period measurements.	D
P2SSS229: The US NDC classified subsystem shall provide functionality to monitor the accuracy of slowness estimation through statistical analysis of slowness residuals.	D
P2SSS230: The US NDC classified subsystem shall provide functionality to monitor the accuracy of azimuth estimation through statistical analysis of azimuth residuals.	D
P2SSS231: The US NDC classified subsystem shall provide functionality to monitor the accuracy of arrival time estimation through statistical analysis of time residuals.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS232: The US NDC classified subsystem shall provide functionality to graphically display the geographic, depth and magnitude distributions of events formed by the automated processing or after analyst review.	D
P2SSS233: The US NDC classified subsystem shall provide functionality to monitor the accuracy of initial phase identification.	D
P2SSS234: The US NDC classified subsystem shall provide functionality to monitor the accuracy of final phase identification after event location.	D
P2SSS235: The US NDC classified subsystem shall provide functionality to monitor the performance of hydroacoustic event-driven processing.	D
P2SSS236: The US NDC classified subsystem shall provide functionality to perform statistical evaluations of automated events that are not validated (false alarms).	D
P2SSS237: The US NDC classified subsystem shall provide functionality to perform statistical evaluations of missed events and missed associations.	D
P2SSS238: The US NDC classified subsystem shall provide functionality to perform statistical evaluations of events common to the automated bulletin and an analyst-reviewed bulletin.	D
P2SSS239: The US NDC classified subsystem shall provide functionality to monitor the use of locating phases in interactive analysis, including teleseismic branches, regional phases and depth phases.	D
P2SSS240: The US NDC classified subsystem shall provide interactive functionality to monitor the retiming of arrivals in interactive analysis.	D
P2SSS241: The US NDC classified subsystem shall provide interactive functionality to monitor the association and disassociation of automated detections in interactive analysis.	D
P2SSS242: The US NDC Training System shall provide all analysis tools available in the US NDC classified subsystem.	D
P2SSS243: The US NDC Training System shall provide the instructor with access to all analysis and maintenance functions.	D
P2SSS244: The US NDC Training System shall provide compatible software to allow interaction between student and instructor workstations for both analysis and computer-assisted instruction.	D
P2SSS245: The US NDC Training System shall project instructor workstation activities to student workstation displays.	D
P2SSS246: The US NDC Training System shall project student activities to the instructor workstation display.	D
P2SSS247: The US NDC Training System shall provide functionality to execute processes for analysis data preparation and student account management from the instructor workstation.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS248: The US NDC Training system shall provide functions necessary to interrupt processes for analysis data preparation and student account management from the instructor workstation.	D
P2SSS249: The US NDC Training System shall notify the instructor of the failure of processes for analysis data preparation and student account management.	T, D
P2SSS250: The US NDC Training System shall log all processes for analysis data preparation and student account management.	I
P2SSS251: The US NDC Training System shall automatically store all classified data processing results.	I
P2SSS252: The US NDC Training System shall provide the functions necessary to automatically generate detection beams using parameters derived from frequency-wave number analysis.	D
P2SSS253: The US NDC Training System shall provide the functions necessary to automatically generate origin beams for the primary P wave steered to origins in the database.	D
P2SSS254: The US NDC Training System shall provide the functions necessary to automatically generate origin beams for long-period phases for origins in the database.	D
P2SSS255: The US NDC Training System shall provide functionality to configure all beam parameters.	D
P2SSS256: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the rate of analyst-verified detections.	T
P2SSS257: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of onset time.	T
P2SSS258: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of amplitude and period.	T
P2SSS259: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of array vector slowness.	T
P2SSS260: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the rate of analyst-verified automated events.	T
P2SSS261: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to read intervals of both seismic and hydroacoustic data in interactive analysis.	T
P2SSS262: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to scroll displayed channels of both seismic and hydroacoustic data in interactive analysis.	T
P2SSS263: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to perform beamforming of seismic data in interactive analysis.	T

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS264: The US NDC classified Phase 2 subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to perform frequency-wave number FK analysis of seismic data in interactive analysis.	T
P2SSS265: The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to run automated pipeline processes (e.g., HydroEDP) between analysis stages in interactive analysis.	T
P2SSS266: The US NDC unclassified subsystem shall support a physical interface to the existing AFTAC Headquarters unclassified network.	I, D
P2SSS267: The US NDC unclassified subsystem shall receive all data from unclassified external sources via its connection to the existing AFTAC Headquarters unclassified network.	I, D
P2SSS268: The US NDC unclassified subsystem shall forward all data to unclassified external clients via its connection to the existing AFTAC Headquarters unclassified network.	I, D
P2SSS269: The US NDC unclassified subsystem shall be capable of exchanging electronic mail with other AFTAC unclassified Local Area Networks (LAN), other external sources and clients, and the Internet via the AFTAC Headquarters unclassified network.	I, D
P2SSS270: The US NDC unclassified subsystem shall provide read-only access to selected files and database tables to other AFTAC unclassified LANs via the AFTAC Headquarters unclassified network.	I, D
P2SSS271: The US NDC unclassified subsystem shall obtain Network Time Protocol (NTP)-based time information via a time source on the AFTAC Headquarters unclassified network.	I, D
P2SSS273: The US NDC classified subsystem shall support a physical connection to the existing AFTAC Headquarters classified network.	I
P2SSS274: The US NDC classified subsystem shall be capable of exchanging electronic mail with other AFTAC classified LANs via the AFTAC Headquarters classified network.	I, D
P2SSS275: The US NDC classified subsystem shall provide read-only access to selected files and database tables. This access will be granted to other AFTAC classified LANs via the AFTAC Headquarters classified network.	I, D
P2SSS276: The US NDC classified subsystem shall obtain NTP-based time information via a time source on the AFTAC Headquarters classified network.	I
P2SSS277: The US NDC shall support a physical interface to the ADSN archive system. The US NDC shall support a physical interface to the ADSN archive system.	I, D
P2SSS278: The US NDC shall have read-only access to the waveform files and database of the ADSN archive system.	I, D
P2SSS279: The US NDC shall support a physical interface to the AFTAC Hydro system.	I
P2SSS280: The US NDC shall receive hydroacoustic waveform data via its physical interface to the AFTAC Hydro system.	I, D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS283: The US NDC shall support Simple Mail Transfer Protocol (SMTP) for all electronic mail communications via its external interfaces.	T, D
P2SSS284: The US NDC shall support NTP for synchronization of all processors to a common time standard.	I, D
P2SSS285: The US NDC shall forward waveform data to clients using the CD 1.0 and CD 1.1 protocols.	D
P2SSS286: The US NDC shall receive waveform data using the CD 1.0 and CD 1.1 protocols from all stations which support these protocols.	D
P2SSS287: The US NDC shall receive waveform data from USAEDS stations using the Data Transaction Center (DTC) protocol.	D
P2SSS288: The US NDC shall receive waveform data from ASN stations in the form of CSS 3.0 datafiles.	D
P2SSS289: The US NDC shall receive waveform data from LANL in the form of SUDS datafiles.	D
P2SSS290: The US NDC classified subsystem shall provide functions to write data to portable media readable by the US NDC Training System.	D
P2SSS291: The US NDC Training System shall provide a GUI to monitor the status of processes for analysis data preparation.	D
P2SSS292: The US NDC Training System shall provide a GUI to monitor the status of processes for student account management.	D
P2SSS293: The US NDC Training System shall be designed to allow loading of alphanumeric data obtained from the US NDC in Oracle export format.	T
P2SSS294: The US NDC Training System shall provide functionality to load waveform data from the US NDC available in Unix tar format.	T
P2SSS295: The US NDC Training System shall provide functionality to read data from portable media prepared on the US NDC.	T
P2SSS296: The US NDC Training System shall provide a GUI to form detection beams on array detections in a user-selected time interval.	T, D
P2SSS297: The US NDC Training System shall provide a GUI to form origin beams on origins in a user-selected time interval.	T, D
P2SSS298: The US NDC Training System shall provide a GUI to load waveform and alphanumeric data over a user-selected time interval.	T, D
P2SSS299: The US NDC Training System shall provide a GUI to delete waveform and alphanumeric data over a user-selected time interval.	T, D
P2SSS300: The US NDC Training System shall support sets of individual database accounts for twelve (12) students to allow each student to perform individual analysis for each of the following processing modes: global, hydro, spotlight and forward.	I, D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS301: The US NDC Training System shall provide a GUI to create student database accounts.	T, D
P2SSS302: The US NDC Training System shall provide a GUI to remove student database accounts.	T, D
P2SSS303: The US NDC Training System student accounts shall have access to all data prepared by the instructor.	T, D
P2SSS304: The US NDC shall automatically backup all on-line waveform data.	I
P2SSS305: The US NDC shall automatically backup all off-line waveform data.	I
P2SSS306: The US NDC shall automatically backup all alphanumeric data.	D
P2SSS307: The US NDC automated backup functionality shall be capable of running concurrently with automated data acquisition, data processing, and data storage functions.	D
P2SSS308: The US NDC shall incorporate functionality to restore all backup waveform data.	D
P2SSS309: The US NDC classified subsystem shall restore all backup alphanumeric data.	D
P2SSS310: The US NDC shall store waveform data in CSS 3.0 wfdisc format.	D
P2SSS311: The US NDC shall be composed of COTS hardware that does not require the use of toxic products or hazardous materials during normal operation or preventive maintenance tasks.	I
P2SSS312: The US NDC shall be composed of COTS hardware that does not contain volatile organic compounds (VOCs), or require the use of VOCs for normal operation or to perform preventive maintenance procedures.	I
P2SSS313: The US NDC shall acquire, process and store data up to the Department of Defense (DoD) Secret level in accordance with (IAW) DAA approved Air Force Manual 33-229, 1 November 1997, Controlled Access Protection (CAP) for Information Security Systems (IS).	D
P2SSS314: The US NDC shall be connected to external interfaces by way of an AFTAC provided firewall to protect it from external access by unauthorized personnel.	I
P2SSS315: The US NDC shall verify user identity prior to gaining access to the US NDC.	D
P2SSS316: The US NDC shall prevent the inadvertent disclosure of information to unauthorized users by protecting primary storage, fixed media, removable media, etc. IAW the object reuse requirements of the CAP for IS systems.	
P2SSS317: The US NDC shall segregate configuration files containing classified or sensitive information into clearly marked directories.	
P2SSS318: The US NDC shall comply with security standards IAW the CAP for legacy systems.	
P2SSS319: The US NDC shall employ security measures to prevent files containing classified information from being transmitted to the unclassified subsystem.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS320: The US NDC shall limit remote system access to specific authorized lists of users on specific authorized machines IAW the discretionary access procedures established in the CAP.	I, D
P2SSS321: The US NDC shall protect the integrity of data from unauthorized modification.	I
P2SSS322: The US NDC shall provide dependable audit capabilities that have the ability to selectively acquire and support tracing events to specific users.	I, D
P2SSS323: The US NDC shall require identification and authentication of all users attempting to log on to the system IAW the CAP for legacy systems.	D
P2SSS324: The US NDC shall provide warning banners advising users of system monitoring activities prior to completion of user login as part of the CAP auditing functionality.	D
P2SSS325: The US NDC shall provide one-way data flow from the unclassified to the classified subsystem.	I
P2SSS326: The US NDC shall provide system security protection for all message transfers from the classified to the unclassified subsystem.	T, D
P2SSS327: The hardware components of the US NDC shall provide hardware capable of operating with 110-120/220-240 volts AC, 60 Hz, single/three phase power.	D
P2SSS328: The US NDC shall operate from the facility uninterruptible power supply (UPS) system to protect the COTS hardware from damaging voltage irregularities and power loss.	D
P2SSS329: The US NDC shall provide hardware components specified to operate within the temperature range of 60 to 90 degrees Fahrenheit.	I
P2SSS330: The US NDC hardware components shall be specified to operate within the relative humidity range of 20% to 80%, non-condensing.	I
P2SSS332: The US NDC shall provide hardware components specified to produce no more than 85db acoustic noise while operating.	I
P2SSS333: The US NDC shall provide the functions to perform orderly shutdown and startup.	D
P2SSS334: The US NDC shall provide functionality to restart each workstation individually without affecting the operation of other workstations in the system.	D
P2SSS335: The US NDC hardware elements shall meet commercial standards for electrostatic discharge.	I
P2SSS336: The US NDC computer hardware shall comply with Part 15 of the Federal Communications Commission (FCC) rules for Class A or Class B digital devices.	I
P2SSS337: The US NDC shall be constructed using COTS hardware.	I
P2SSS338: The US NDC Training System shall utilize hardware functionally compatible with the US NDC system.	I

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS340: The US NDC Training System shall provide a workstation for the instructor.	I
P2SSS341: The US NDC Training System shall provide workstations to accommodate six (6) students.	I
P2SSS342: The US NDC Training System shall provide functionality to produce high quality, black-and-white and color, hard copy reports and graphical output.	D
P2SSS343: The US NDC Training System shall use interchangeable workstations and LRUs for items replicated in the training system.	I
P2SSS344: The US NDC Training System shall provide functionality to perform an orderly startup and shutdown.	D
P2SSS345: The US NDC Training System shall provide functionality to automatically shutdown prior to losing backup power from a UPS.	T
P2SSS346: The US NDC unclassified subsystem shall have the capacity to store waveform data as characterized in Table 1 for up to 13 days in on-line short-term storage.	I
P2SSS347: The US NDC shall provide system-level access to all waveform data in on-line short-term storage with latency to first data accessed, of less than five seconds.	T
P2SSS348: The US NDC shall transfer waveform data from on-line short-term storage at a rate of at least 500 kilobytes per second.	T
P2SSS349: The US NDC classified subsystem shall have the capacity to store waveform data characterized in Table 1 for at least 45 days in on-line short-term storage.	I
P2SSS350: The US NDC unclassified subsystem shall have the capacity to store waveform data as characterized in Table 1 for at least 180 days in on-line long-term storage.	I
P2SSS351: The US NDC classified subsystem shall have the capacity to store waveform data as characterized in Table 1 for at least 60 days in on-line long-term storage.	I
P2SSS352: The US NDC shall provide access to waveform data in on-line long-term storage with a latency, to first data accessed, of less than one hour.	T
P2SSS353: The US NDC shall transfer waveform data from long-term storage at a rate of at least 500 kilobytes per second.	T
P2SSS354: The US NDC shall provide access to waveform data in off-line permanent storage with a latency, to first data accessed, of less than one hour from the time the tape is loaded onto the system.	T
P2SSS355: The US NDC shall transfer waveform data from off-line permanent storage at a rate of at least 500 kilobytes per second.	T
P2SSS356: The US NDC classified subsystem shall have the capacity to store waveform data characterized in Table 1 and associated waveform descriptor records over 180 days old for the life of the system in off-line permanent storage.	D
P2SSS357: The US NDC shall store all waveform and alphanumeric data on portable permanent storage media.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS358: The US NDC unclassified subsystem shall have the capacity to buffer at least 8 hours of all incoming waveform data, as characterized in Table 1.	D
P2SSS359: The US NDC classified subsystem shall have the capacity to buffer at least 8 hours of all incoming waveform data, as characterized in Table 1.	D
P2SSS360: The US NDC shall use storage media that has a minimum 10-year shelf life.	I
P2SSS361: The US NDC unclassified subsystem shall have a database with the table space capacity to store 180 days of alphanumeric wfdisc records on-line.	I
P2SSS362: The US NDC unclassified subsystem database shall have the table space capacity to store 180 days of alphanumeric IDC bulletin data on-line.	I
P2SSS363: The US NDC classified subsystem shall have a database with the table space capacity to store all alphanumeric data processing and analysis records on-line for the life of the system.	I
P2SSS364: The US NDC shall provide functionality to store all data processing results off-line.	I
P2SSS366: The US NDC Training System shall make waveform data on-line and accessible to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.	T
P2SSS368: The US NDC Training System shall make alphanumeric data available to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.	D
P2SSS369: The US NDC Training System shall automatically backup all derived waveform and alphanumeric data once daily to offline storage.	D
P2SSS370: The US NDC Training System shall restore data from an offline backup.	A, T
P2SSS371: The US NDC Training System shall provide functionality to ensure data storage integrity of all data.	A
P2SSS372: The US NDC software shall be written in high order programming languages, minimizing the number of languages.	I
P2SSS373: The US NDC shall make maximum use of COTS and Government off the Shelf (GOTS) software.	I
P2SSS374: The US NDC shall have software with a uniform and consistent user interface for access to all the interactive processing functionality within the US NDC.	I
P2SSS375: The US NDC shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the US NDC without interruptions.	I, D
P2SSS376: The US NDC shall incorporate the Oracle Server Enterprise Edition product, version 8.1.7.	I
P2SSS377: The US NDC shall provide a COTS distributed processing system to manage distributed processes.	I

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS378: The US NDC Training System shall provide software required for database management of student accounts.	D
P2SSS379: The US NDC Training System shall utilize software compatible with the US NDC.	I, A, T, D
P2SSS380: The US NDC shall be partitioned into discrete subsystems that are connected through a local area network (LAN).	I, D
P2SSS381: The US NDC shall have a hardware mission MTBCF of no less than 2160 hours when operating in an environment specified in Section 3.9 of this document. The MTBCF parameter is based on MCH.	A
P2SSS382: The US NDC shall have a mission profile of operating 52 weeks per year, 7 days per week and 24 hours per day.	A
P2SSS383: The US NDC hardware MRT shall be 21.8 hours. The MRT parameter is based on MCH.	A
P2SSS384: The US NDC shall have a hardware MTTR of less than two hours at the 95th percentile.	A
P2SSS385: The US NDC shall be designed for organizational and depot levels of maintenance.	I
P2SSS386: The US NDC shall provide functionality to automatically monitor, collect, and report fault information.	D
P2SSS387: The US NDC shall achieve a minimum time between preventive maintenance routines (PMRs) of 720 hours.	A
P2SSS388: The US NDC shall not have system outages due to PMRs.	A
P2SSS389: The US NDC COTS hardware selection shall consider fault detection and isolation capabilities to maximize MCH failure detection and reporting.	A, D
P2SSS390: The US NDC shall detect and report the loss of a storage device.	T
P2SSS391: The US NDC shall maximize the use of storage devices (controller modules, disk trays, drives, etc.) that have the capabilities of automatic failover and hot spare.	I
P2SSS392: The US NDC shall allow for data recovery in the event of storage device failure.	D
P2SSS393: All US NDC detected hardware faults shall be isolated to one LRU as directed by the COTS Field Engineering Handbook for the given hardware system using a combination of automatic fault isolation and interactive troubleshooting.	A, D
P2SSS394: The US NDC shall be designed to enable LRU removal, replacement, and reinstallation within one hour.	D
P2SSS395: A sparing analysis shall be conducted after CDR by a joint Government and Contractor team. MCH will be evaluated for suitable sparing levels to support mission availability requirements.	A

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS396: The US NDC data storage function shall be designed so that individual storage devices may be removed and replaced without loss of data or system integrity.	D
P2SSS397: The US NDC repair time for MCH failures shall not exceed 4 hours.	A
P2SSS398: The US NDC shall maximize the use of interchangeable workstations, LRUs and other interchangeable hardware.	I
P2SSS399: The US NDC shall provide a minimum operational availability of 99%.	A
P2SSS400: The US NDC Training System shall support mission duration of 8 hours per day, 5 days per week, 250 days per year.	A
P2SSS401: The US NDC Training System shall provide a minimum MTBCF of 1500 hours. A critical failure is defined as a failure that requires longer than 2 hours to repair.	A
P2SSS402: The US NDC Training System shall provide an MTTR of less than 2 hours for 95% of repairs.	A
P2SSS403: The US NDC Training System shall include the functionality to isolate all faults to one LRU using a combination of fault isolation and interactive troubleshooting procedures contained in system documentation.	D
P2SSS404: The US NDC Training System shall support the use of an alternate storage device to allow for continued system operations in the event of a storage device failure.	D
P2SSS405: The US NDC Training System shall be designed to enable LRU removal, replacement, and reinstallation within one hour.	A
P2SSS406: The US NDC Training System data storage function shall be designed so that individual storage devices may be removed and replaced without loss of data or system integrity.	D
P2SSS407: The US NDC Training System shall be designed for a two-level (organizational and depot) maintenance concept.	I
P2SSS408: The US NDC Training System shall provide a minimum time between PMRs of 720 hours.	A
P2SSS409: The US NDC Training System shall provide system documentation appropriate for the organizational and depot maintenance levels.	I
P2SSS410: The US NDC shall be designed to have its hardware and software incrementally upgraded over its operational lifetime, including the ability to add functionality, increase processing capacity, and increase memory storage capacity without unplanned loss of previous capabilities.	I, D
P2SSS411: The US NDC classified subsystem shall provide the functionality to interactively process acquired waveform data from auxiliary seismic stations, if this Phase 1 Upgrade functionality is available prior to the Build 1 software baseline freeze.	D
P2SSS413: The US NDC Training System shall be equipped with an in-line uninterruptable power supply function that provided a minimum of 30 minutes of backup power.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS436: The US NDC Training System shall operate at an acoustic noise level of less than 85 decibels.	I
P2SSS437: The US NDC Training System shall acquire, process, and store data up to the DoD Secret level in accordance with CAP procedure established by the US Air Force for legacy based IS.	D
P2SSS442: The US NDC Training System shall be composed of COTS hardware that does not require the use of toxic products or hazardous materials during normal operation or preventive maintenance tasks.	I
P2SSS443: The US NDC Training System shall be composed of COTS hardware that does not contain volatile organic compounds (VOCs), or require the use of VOCs for normal operation or to perform preventive maintenance procedures.	I
P2SSS451: The US NDC Training System shall have hardware capable of operating with 110-120/220-240 volts AC, 60 Hz, single/three phase power.	I, D
P2SSS452: The US NDC Training System shall provide hardware components specified to operate within the temperature range of 60 to 90 degrees Fahrenheit.	I
P2SSS453: The US NDC Training System components shall be specified to operate within the relative humidity range of 20% to 80%, non-condensing.	I
P2SSS454: The US NDC Training System hardware elements shall meet commercial standards for electrostatic discharge.	I
P2SSS455: The US NDC Training System computer hardware shall comply with Part 15 of the Federal Communications Commission (FCC) rules for Class A or Class B digital devices.	I
P2SSS456: The US NDC Training System shall be written in high order programming languages, minimizing the number of languages.	I
P2SSS457: The US NDC Training System shall have software with a uniform and consistent user interface for access to all the interactive processing functionality within the Training System.	I, D
P2SSS458: The US NDC Training System shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the Training System without interruptions.	I
P2SSS459: The US NDC Training System shall be designed to have its hardware and software incrementally upgraded over its operational lifetime, including the ability to add functionality, increase processing capacity, and increase memory storage capacity without unplanned loss of previous capabilities	I, D
P2SSS460: The US NDC Training System shall provide on-line storage capacity for at least fifteen (15) 24 hour days of waveform data for all stations characterized in Table 1. Use of existing storage hardware and its capacity of 18GB per day is acceptable.	I
P2SSS461: The US NDC Training System shall provide functionality to edit any measurement used for location, magnitude or discriminant analysis.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS462: The US NDC Training System shall retain all original processing results when edited.	D
P2SSS463: The US NDC Training System shall store the results of each analysis stage.	D
P2SSS464: The US NDC Training System shall provide functionality to automatically perform event formation using user-selected detections.	D
P2SSS465: The US NDC Training System shall provide interactive functionality to select those data that are defining for event magnitude.	D
P2SSS467: The US NDC classified subsystem shall automatically perform long-period signal detection and processing through Event-Driven Processing (EDP), to associate long-period phases to events formed using short-period seismic signals, if this Phase 1 Upgrade capability is available prior to the Build 1 software baseline freeze.	D
P2SSS468: The US NDC shall provide functionality to produce high quality, black-and-white and color, hard copy reports and graphical output.	D
P2SSS470: The US NDC Training System shall provide the functionality to automatically generate event reports.	I, D
P2SSS471: The US NDC Training System shall provide the functionality to include in event reports the following event attributes: latitude, longitude, depth/elevation, time, magnitude, priority, discrimination data, waveform graphics, event summary text.	I, D
P2SSS472: The US NDC Training System shall limit system access to specific authorized lists of users on specific authorized machines IAW the discretionary access procedures established in the CAP.	D
P2SSS473: The US NDC Training System shall verify user identity prior to gaining access to the Training System.	D
P2SSS474: The US NDC Training System shall prevent the inadvertent disclosure of information to unauthorized users by protecting primary storage, fixed media, removable media, etc. IAW the object reuse requirements of the DAA approved Air Force Manual 33-229, 1 November 1997, CAP for IS systems.	D
P2SSS475: The US NDC Training System shall comply with security standards IAW the CAP.	D
P2SSS476: The US NDC Training System shall protect the integrity of data from unauthorized modification.	D
P2SSS477: The US NDC Training System shall provide dependable audit capabilities that have the ability to selectively acquire and support tracing events to specific users.	D
P2SSS479: The US NDC Training System shall require identification and authentication of all users attempting to log on to the system IAW the CAP for legacy systems.	D
P2SSS480: The US NDC Training System shall provide warning banners advising users of system monitoring activities prior to completion of user login as part of the CAP auditing functionality.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS482: The US NDC Training System shall make maximum use of COTS and Government off the Shelf (GOTS) software.	I
P2SSS483: The US NDC classified subsystem shall provide the functionality to prepare teleseismic and regional beams for short-period, broadband and long-period seismic signals, for display during analysis.	D
P2SSS484: The US NDC classified subsystem shall provide the functionality to make measurements on processed and unprocessed data.	D
P2SSS485: The US NDC classified subsystem shall provide the functionality to interactively initiate all Event-Driven Processing (EDP) functions.	D
P2SSS486: The US NDC Training System shall provide on-line storage capacity for at least 15 days of seismic and hydroacoustic alphanumeric data from the US NDC under nominal loading. Use of existing storage hardware and its capacity of 18GB per day is acceptable.	I
P2SSS487: The US NDC unclassified subsystem shall automatically request, when protocol allows, retransmission of corrupt and missing waveform data from any acquisition site within one hour of initial data transfer until all corrupt and missing data are acquired.	D
P2SSS488: The US NDC classified subsystem shall provide functionality to allow the insertion of new types of filters.	D
P2SSS489: The US NDC classified subsystem shall provide functionality to allow insertion of new algorithms for data quality control.	D
P2SSS490: The US NDC classified subsystem shall automatically group regional seismic signals from a single station that emanates from the same event.	D
P2SSS492: The US NDC classified subsystem shall provide the functionality to automatically prepare detection beams for array sensor stations, from frequency-wave number (FK) processing, for display during analysis.	D
P2SSS493: The US NDC databases shall employ appropriate techniques (for example, check constraints or triggers) to prevent the entry of out-of-range data.	D
P2SSS495: The US NDC databases shall prevent the entry of duplicate data records.	D
P2SSS496: The US NDC databases shall enforce parent-child relationships between tables where appropriate.	D
P2SSS497: Users of US NDC databases shall be granted privileges appropriate to their level of access by means of pre-defined roles.	D
P2SSS498: The US NDC Oracle databases shall implement session-level temporary tables where appropriate.	D
P2SSS499: The US NDC classified subsystem shall provide read and execution access to system applications, parameter and recipe files, and documentation from the AFTAC Headquarters classified network.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS500: The US NDC shall have the capability to automatically acquire up to 200 Mbytes of radionuclide sensor data in a 24-hour period.	D
P2SSS502: The US NDC hardware purchased after Phase 2 Build 1 CDR shall have a 5-year service life from the conclusion of Phase 2 Build 1 SAT.	I
P2SSS503: The US NDC shall include an Operational subsystem LAN.	D
P2SSS504: The US NDC shall include a Developmental subsystem LAN.	D
P2SSS505: The US NDC shall include a Sustainment subsystem LAN.	D
P2SSS506: The US NDC Sustainment LAN shall be configured to allow development and testing of sustainment activities associated with the Operational subsystem.	D
P2SSS507: The US NDC shall provide a separate and distinct Training subsystem LAN.	D
P2SSS508: The US NDC Sustainment subsystem shall be fully functionally redundant to the Operational subsystem with the exception of shared archive components and data feeds.	D
P2SSS509: The US NDC shall have its low-to-high data transfer mechanism enhanced to include new data application protocols and it shall meet the security requirements of the Defense Information Systems Agency Multi-level Security Office (DISA/MLS).	I
P2SSS510: The US NDC permanent storage system shall not rely on a proprietary database management system for access.	I
P2SSS511: The US NDC shall support the Transport Control Protocol/Internet Protocol (TCP/IP) suite for communications over the physical interfaces it supports.	T, D
P2SSS513: In the event of an outage (communications, DAS, diode, or CAS), the US NDC shall acquire waveform data at no less than a 2:1 (data duration/elapsed time) ratio rate. (Depending on its capacity, a station might send 12 hours of near-realtime data while simultaneously sending 12 hours of older data).	D
P2SSS514: In the event of an outage, the US NDC Global station processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration) ratio, under non-swarm conditions.	D
P2SSS515: In the event of an outage, the US NDC Global network processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration) ratio, under non-swarm conditions.	D
P2SSS516: In the event of an outage, the US NDC Spotlight station processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration ratio), under non-swarm conditions.	D
P2SSS517: The US NDC Backward processing intervals shall successfully complete at no less than a 1:1 (data duration/processing duration) ratio, under non-swarm conditions.	D
P2SSS518: The US NDC shall automatically acquire all IDC bulletin data in alphanumeric format within one hour of the IDC making the data available to the NDC.	D

Table 5. Qualification Method (Continued)

REQUIREMENTS	QUALIFICATION METHOD
P2SSS519: The US NDC Training System shall operate from an uninterruptible power supply (UPS) system to protect the COTS hardware from damaging voltage irregularities and power loss.	I
P2SSS520: The US NDC Training System shall provide functionality to restart each workstation individually without affecting the operation of other workstations in the system.	D
P2SSS521: The US NDC shall support the use of an alternate storage device to allow for continued system operations in the event of a storage device failure.	D
P2SSS522: The US NDC shall provide interactive functionality to automatically execute data acquisition, data processing and data storage functions.	D
P2SSS526: The US NDC databases shall prevent entry of data records into child tables unless the appropriate matching records exist in the parent tables.	D
P2SSS527: The US NDC databases shall ensure that related records in child tables are deleted whenever records in parent tables are deleted.	D
P2SSS528: Attempts by US NDC applications software to enter duplicate data records, invalid child records or out-of-range data into the US NDC databases shall be logged to application level log files.	D
P2SSS529: The US NDC databases shall prevent entry of data records into child tables unless the appropriate matching records exist in the parent tables.	D
P2SSS530: The US NDC shall ensure that related records in child tables are deleted whenever records in parent tables are deleted.	D
P2SSS531: Attempts by US NDC applications software to enter duplicate data records, invalid child records or out-of-range data into the US NDC databases shall be logged to application level log files.	D
P2SSS532: The US NDC classified subsystem shall acquire uncorrupted 99.999% of the waveform data frames forwarded from the unclassified subsystem. (This is a failure rate of approximately 1 frame per station every 12 days).	I, D
P2SSS533: The US NDC shall use Tuxedo Distributed Application Control Software (DACS) for distributed processing.	I
P2SSS534: The US NDC classified subsystem shall provide the functionality to configure the data processing and display parameters on a station-by-station basis to suit the Broad-Area processing regions of interest within the Global processing pipeline.	D
P2SSS535: The US NDC shall use a flat-file format for permanent storage.	I
P2SSS536: The US NDC data transfer mechanism shall meet the security requirements of the Defense Information Systems Agency Multi-level Security Office (DISA/MLS).	I
P2SSS537: The US NDC shall incorporate we-based event bulletin software. (Deferred)	D

5. Requirements Traceability

Table 6 traces the specifications to the draft Phase 2 SRD. The table gives the SRD requirement in **bold** font followed by the SSS specifications derived from that SRD requirement. Table 7 traces the higher-level requirements R1.1 through R1.9 from the SRD requirements in Appendix C to the SSS specifications.

Table 6. Requirements Traceability

SRD NO.	REQUIREMENT
P2SRD1:	N3.1.a The Phase 2 US NDC shall continue to meet all capabilities from the Phase 1 US NDC system.
P2SSS29:	The US NDC shall automatically acquire all IDC waveform availability data in alphanumeric format within one hour of the IDC making the data available to the NDC.
P2SSS31:	The US NDC shall automatically acquire all USGS alphanumeric bulletin products in alphanumeric format within one hour of the USGS making the data available to the NDC.
P2SSS41:	The US NDC shall automatically forward data, within 60 seconds of acquiring the data from US territorial stations identified in the Comprehensive Test Ban Treaty (CTBT), to the IDC.
P2SSS256:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the rate of analyst-verified detections.
P2SSS257:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of onset time.
P2SSS258:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of amplitude and period.
P2SSS259:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for automated measurement of array vector slowness.
P2SSS260:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the rate of analyst-verified automated events.
P2SSS261:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to read intervals of both seismic and hydroacoustic data in interactive analysis.
P2SSS262:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to scroll displayed channels of both seismic and hydroacoustic data in interactive analysis.
P2SSS263:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to perform beamforming of seismic data in interactive analysis.
P2SSS264:	The US NDC classified Phase 2 subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to perform frequency-wave number FK analysis of seismic data in interactive analysis.
P2SSS265:	The US NDC classified subsystem shall meet or exceed the capabilities of the Phase 1 system for the amount of time it takes to run automated pipeline processes (e.g., HydroEDP) between analysis stages in interactive analysis.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS277:	The US NDC shall support a physical interface to the ADSN archive system. The US NDC shall support a physical interface to the ADSN archive system.
P2SSS278:	The US NDC shall have read-only access to the waveform files and database of the ADSN archive system.
P2SSS338:	The US NDC Training System shall utilize hardware functionally compatible with the US NDC system.
P2SSS340:	The US NDC Training System shall provide a workstation for the instructor.
P2SSS341:	The US NDC Training System shall provide workstations to accommodate six (6) students.
P2SSS342:	The US NDC Training System shall provide functionality to produce high quality, black-and-white and color, hard copy reports and graphical output.
P2SSS343:	The US NDC Training System shall use interchangeable workstations and LRUs for items replicated in the training system.
P2SSS344:	The US NDC Training System shall provide functionality to perform an orderly startup and shutdown.
P2SSS345:	The US NDC Training System shall provide functionality to automatically shutdown prior to losing backup power from a UPS.
P2SSS347:	The US NDC shall provide system-level access to all waveform data in on-line short-term storage with latency to first data accessed, of less than five seconds.
P2SSS348:	The US NDC shall transfer waveform data from on-line short-term storage at a rate of at least 500 kilobytes per second.
P2SSS352:	The US NDC shall provide access to waveform data in on-line long-term storage with a latency, to first data accessed, of less than one hour.
P2SSS353:	The US NDC shall transfer waveform data from long-term storage at a rate of at least 500 kilobytes per second.
P2SSS354:	The US NDC shall provide access to waveform data in off-line permanent storage with a latency, to first data accessed, of less than one hour from the time the tape is loaded onto the system.
P2SSS355:	The US NDC shall transfer waveform data from off-line permanent storage at a rate of at least 500 kilobytes per second.
P2SSS360:	The US NDC shall use storage media that has a minimum 10-year shelf life.
P2SSS366:	The US NDC Training System shall make waveform data on-line and accessible to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.
P2SSS368:	The US NDC Training System shall make alphanumeric data available to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.
P2SSS370:	The US NDC Training System shall restore data from an offline backup.
P2SSS378:	The US NDC Training System shall provide software required for database management of student accounts.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS379:	The US NDC Training System shall utilize software compatible with the US NDC.
P2SSS451:	The US NDC Training System shall have hardware capable of operating with 110-120/220-240 volts AC, 60 Hz, single/three phase power.
P2SSS458:	The US NDC Training System shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the Training System without interruptions.
P2SSS460:	The US NDC Training System shall provide on-line storage capacity for at least fifteen (15) 24 hour days of waveform data for all stations characterized in Table 1. Use of existing storage hardware and its capacity of 18GB per day is acceptable.
P2SSS473:	The US NDC Training System shall verify user identity prior to gaining access to the Training System.
P2SSS518:	The US NDC shall automatically acquire all IDC bulletin data in alphanumeric format within one hour of the IDC making the data available to the NDC.
P2SRD2:	N3.1.b The US NDC shall consist of a distributed processing system made up of COTS-based equipment and connected through a local area network (LAN).
P2SSS337:	The US NDC shall be constructed using COTS hardware.
P2SSS377:	The US NDC shall provide a COTS distributed processing system to manage distributed processes.
P2SSS380:	The US NDC shall be partitioned into discrete subsystems that are connected through a local area network (LAN).
P2SSS468:	The US NDC shall provide functionality to produce high quality, black-and-white and color, hard copy reports and graphical output.
P2SRD3:	N3.1.c The US NDC shall be partitioned into discrete subsystems: an Operational subsystem, a Development subsystem, a Sustainment subsystem LAN (which allows development and testing to continue simultaneously with system operation), a Training subsystem, and an alternate operational subsystem.
P2SSS380:	The US NDC shall be partitioned into discrete subsystems that are connected through a local area network (LAN).
P2SSS503:	The US NDC shall include an Operational subsystem LAN.
P2SSS504:	The US NDC shall include a Developmental subsystem LAN.
P2SSS505:	The US NDC shall include a Sustainment subsystem LAN.
P2SSS506:	The US NDC Sustainment LAN shall be configured to allow development and testing of sustainment activities associated with the Operational subsystem.
P2SSS507:	The US NDC shall provide a separate and distinct Training subsystem LAN.
P2SRD4:	N3.1.d The US NDC shall provide the capability to undergo a full development and operational test and evaluation on the Development subsystem with no impact to ongoing operations.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS380:	The US NDC shall be partitioned into discrete subsystems that are connected through a local area network (LAN).
P2SSS506:	The US NDC Sustainment LAN shall be configured to allow development and testing of sustainment activities associated with the Operational subsystem.
P2SRD5:	N3.1.e The US NDC Development subsystem shall be fully functionally redundant with the Operational subsystem, with no shared components between subsystems except for data feeds and archives.
P2SSS380:	The US NDC shall be partitioned into discrete subsystems that are connected through a local area network (LAN).
P2SSS508:	The US NDC Sustainment subsystem shall be fully functionally redundant to the Operational subsystem with the exception of shared archive components and data feeds.
P2SRD6:	N3.2.a The US NDC shall automatically execute data acquisition, data processing, and data storage functions.
P2SSS4:	The US NDC shall be able to automatically initiate processing based on configurable criteria including, as a minimum, time, availability of data, and completion of prior processing steps.
P2SSS5:	The US NDC shall control sequencing of multiple processes so dependent processes are executed in sequential or parallel paths.
P2SSS6:	The US NDC shall provide configurable sequencing for processes, and shall support rule-based processing of sequential tasks such that the success or failure of one task can initiate another task.
P2SSS7:	The US NDC shall provide status for all automated processes.
P2SSS8:	The US NDC shall provide logging for all automated processes.
P2SSS9:	The US NDC shall provide a common interface for the review of all logs.
P2SSS10:	The US NDC shall provide functionality to automatically and immediately notify users at the System Operations Manager (SOM) and Data Acquisition Manager (DAM) consoles of the failure of any individual process.
P2SSS375:	The US NDC shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the US NDC without interruptions.
P2SSS522:	The US NDC shall provide interactive functionality to automatically execute data acquisition, data processing and data storage functions.
P2SRD7:	N3.2.b The US NDC shall provide manual execution capability for all automated data acquisition, data processing, and data storage functions.
P2SSS2:	The US NDC shall provide interactive functionality to execute all automated data acquisition, data processing, and data storage functions.
P2SSS3:	The US NDC shall provide functionality to initiate and interrupt all automated processing tasks on the system from a controlled interface.
P2SSS5:	The US NDC shall control sequencing of multiple processes so dependent processes are executed in sequential or parallel paths.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS6:	The US NDC shall provide configurable sequencing for processes, and shall support rule-based processing of sequential tasks such that the success or failure of one task can initiate another task.
P2SRD8:	N3.3.a The US NDC shall use standard data input formats for waveform data.
P2SSS11:	The US NDC shall acquire waveform data in the format outlined in section 3.3.2 of this document.
P2SSS285:	The US NDC shall forward waveform data to clients using the CD 1.0 and CD 1.1 protocols.
P2SSS286:	The US NDC shall receive waveform data using the CD 1.0 and CD 1.1 protocols from all stations which support these protocols.
P2SSS287:	The US NDC shall receive waveform data from USAEDS stations using the Data Transaction Center (DTC) protocol.
P2SSS288:	The US NDC shall receive waveform data from ASN stations in the form of CSS 3.0 datafiles.
P2SSS289:	The US NDC shall receive waveform data from LANL in the form of SUDS datafiles.
P2SSS310:	The US NDC shall store waveform data in CSS 3.0 wfdisc format.
P2SRD9:	N3.3.b The US NDC shall have forward and backward compatibility with the standard waveform data.
P2SSS285:	The US NDC shall forward waveform data to clients using the CD 1.0 and CD 1.1 protocols.
P2SSS286:	The US NDC shall receive waveform data using the CD 1.0 and CD 1.1 protocols from all stations which support these protocols.
P2SSS287:	The US NDC shall receive waveform data from USAEDS stations using the Data Transaction Center (DTC) protocol.
P2SSS288:	The US NDC shall receive waveform data from ASN stations in the form of CSS 3.0 datafiles.
P2SSS289:	The US NDC shall receive waveform data from LANL in the form of SUDS datafiles.
P2SRD10:	N3.4.a The US NDC shall provide the capability to acquire authenticated data.
P2SSS13:	The US NDC shall acquire and validate authenticated data using SDAS OMS software. (Deferred)The US NDC shall acquire and validate authenticated data using SDAS OMS software. (Deferred)
P2SRD11:	N3.5.a The US NDC shall support interfaces to the existing AFTAC Headquarters unclassified and classified broadband network for electronic mail, the transfer of data files and read-only access to the database, and exchange bulletin results.
P2SSS266:	The US NDC unclassified subsystem shall support a physical interface to the existing AFTAC Headquarters unclassified network.
P2SSS267:	The US NDC unclassified subsystem shall receive all data from unclassified external sources via its connection to the existing AFTAC Headquarters unclassified network.
P2SSS268:	The US NDC unclassified subsystem shall forward all data to unclassified external clients via its connection to the existing AFTAC Headquarters unclassified network.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS269:	The US NDC unclassified subsystem shall be capable of exchanging electronic mail with other AFTAC unclassified Local Area Networks (LAN), other external sources and clients, and the Internet via the AFTAC Headquarters unclassified network.
P2SSS270:	The US NDC unclassified subsystem shall provide read-only access to selected files and database tables to other AFTAC unclassified LANs via the AFTAC Headquarters unclassified network.
P2SSS271:	The US NDC unclassified subsystem shall obtain Network Time Protocol (NTP)-based time information via a time source on the AFTAC Headquarters unclassified network.
P2SSS273:	The US NDC classified subsystem shall support a physical connection to the existing AFTAC Headquarters classified network.
P2SSS274:	The US NDC classified subsystem shall be capable of exchanging electronic mail with other AFTAC classified LANs via the AFTAC Headquarters classified network.
P2SSS275:	The US NDC classified subsystem shall provide read-only access to selected files and database tables. This access will be granted to other AFTAC classified LANs via the AFTAC Headquarters classified network.
P2SSS276:	The US NDC classified subsystem shall obtain NTP-based time information via a time source on the AFTAC Headquarters classified network.
P2SSS283:	The US NDC shall support Simple Mail Transfer Protocol (SMTP) for all electronic mail communications via its external interfaces.
P2SSS284:	The US NDC shall support NTP for synchronization of all processors to a common time standard.
P2SSS499:	The US NDC classified subsystem shall provide read and execution access to system applications, parameter and recipe files, and documentation from the AFTAC Headquarters classified network.
P2SSS511:	The US NDC shall support the Transport Control Protocol/Internet Protocol (TCP/IP) suite for communications over the physical interfaces it supports.
P2SRD12:	N3.6.a The US NDC shall automatically acquire unprocessed seismic, hydroacoustic, infrasonic, and radionuclide sensor data.
P2SSS12:	The US NDC shall automatically acquire unprocessed waveform data at the capacity characterized in Table 1.
P2SSS32:	The US NDC shall acquire ancillary data available in CD 1.0 and 1.1 frames, from sensor sites.
P2SSS33:	The US NDC shall provide a comprehensive GUI that displays ancillary data from sensor sites. The GUI will be integrated with station and sensor status displays. (Deferred)
P2SSS34:	The US NDC shall ensure data integrity through data acquisition statistics tracked on an individual channel basis as a function of time for seismic, hydroacoustic, and infrasonic waveform data. (Deferred)
P2SSS35:	The US NDC data acquisition statistics shall track latency, gaps, and zero fills in data acquired at the US NDC unclassified and classified subsystems' front-end, and data acquired on the US NDC classified subsystem from the US NDC unclassified subsystem. (Deferred)
P2SSS36:	The US NDC shall track station connections to the US NDC unclassified and classified subsystems' front-end.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS37:	The US NDC shall distinguish between missing and incomplete waveform data if supported by the data transfer protocol.
P2SSS279:	The US NDC shall support a physical interface to the AFTAC Hydro system.
P2SSS280:	The US NDC shall receive hydroacoustic waveform data via its physical interface to the AFTAC Hydro system.
P2SSS500:	The US NDC shall have the capability to automatically acquire up to 200 Mbytes of radionuclide sensor data in a 24-hour period.
P2SRD13:	N3.6.1.a The US NDC shall provide internal communication and data transfer protocols to ensure positive confirmation of 100% of data transfer and data integrity prior to deleting data from data buffers, including transfer of data from the unclassified to the classified subsystem and transfer of data between different storage media.
P2SSS40:	The US NDC unclassified subsystem shall automatically forward all acquired waveform data to the classified subsystem within 60 seconds of receiving the data at the unclassified US NDC front-end.
P2SSS42:	The US NDC shall verify 100% of the available waveform data in the source buffers has transferred entirely and correctly to the destination buffers prior to any deletion command being given to the source buffers.
P2SSS43:	The US NDC classified subsystem shall automatically generate a bulletin requesting re-transmission of any channel of corrupt and missing data from the unclassified subsystem within 60 seconds of the end of the frame until all corrupt and missing data are acquired.
P2SSS487:	The US NDC unclassified subsystem shall automatically request, when protocol allows, retransmission of corrupt and missing waveform data from any acquisition site within one hour of initial data transfer until all corrupt and missing data are acquired.
P2SSS509:	The US NDC shall have its low-to-high data transfer mechanism enhanced to include new data application protocols and it shall meet the security requirements of the Defense Information Systems Agency Multi-level Security Office (DISA/MLS).
P2SSS513:	In the event of an outage (communications, DAS, diode, or CAS), the US NDC shall acquire waveform data at no less than a 2:1 (data duration/elapsed time) ratio rate. (Depending on its capacity, a station might send 12 hours of near-realtime data while simultaneously sending 12 hours of older data).
P2SSS532:	The US NDC classified subsystem shall acquire uncorrupted 99.999% of the waveform data frames forwarded from the unclassified subsystem. (This is a failure rate of approximately 1 frame per station every 12 days).
P2SSS536:	The US NDC data transfer mechanism shall meet the security requirements of the Defense Information Systems Agency Multi-level Security Office (DISA/MLS).
P2SSS14:	The US NDC shall monitor remote field stations.
P2SSS15:	The US NDC shall provide a continuous display of all seismic, hydroacoustic, and infrasonic station and sensor status.
P2SSS16:	The US NDC shall provide a GUI to continuously display unprocessed waveforms.
P2SSS17:	The US NDC shall provide a GUI to continuously monitor communications between the US NDC and external sites.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS18:	The US NDC shall provide a GUI to continuously monitor remote seismic, hydroacoustic and infrasonic field sensors and digitizers.
P2SSS19:	The US NDC shall provide a GUI to continuously monitor radionuclide stations.
P2SSS20:	The US NDC shall calibrate and control remote field stations. (Deferred)
P2SSS21:	The US NDC shall transmit calibration and control signals to all AFTAC-controlled sensor stations listed in the US NDC NDDOC dated April 2001. (Deferred)
P2SSS22:	The US NDC shall provide a GUI to perform maintenance tasks associated with field site calibration, analysis, diagnostics, and communications. (Deferred)
P2SSS23:	The US NDC shall remotely command, control, configure, and reconfigure, seismic hydroacoustic, and infrasonic field equipment. (Deferred)
P2SSS24:	The US NDC shall provide a GUI that displays calibration analysis results from seismic, hydroacoustic, and infrasonic sites. (Deferred)
P2SSS25:	The US NDC shall automatically update sensor calibration results for seismic, hydroacoustic, and infrasonic sites, provided the results are available in the protocol. (Deferred)
P2SSS26:	The US NDC shall automatically update sensor calibration information for seismic, hydroacoustic, and infrasonic sites. (Deferred)
P2SSS27:	The US NDC shall provide a GUI that displays frequency, amplitude, and phase response values for each seismic, hydroacoustic, and infrasonic site. (Deferred)
P2SSS28:	The US NDC shall store frequency, amplitude, and phase response values for each seismic, hydroacoustic, and infrasonic site acquired at the US NDC. (Deferred)
P2SSS537:	The US NDC shall incorporate we-based event bulletin software. (Deferred)
P2SRD15:	N3.7.a The US NDC shall automatically store all data processing results and associated data as soon as they are available.
P2SSS95:	The US NDC classified subsystem shall provide the capacity to store up to 60,000 detections per day stored online for the life of the system.
P2SSS106:	The US NDC classified subsystem shall provide functionality to store a representative beam for each detection.
P2SSS107:	The US NDC classified subsystem shall store data quality statistics, detection information and measured features for use by later processing.
P2SSS139:	The US NDC classified subsystem shall store the results of phase identification, association, location and magnitude estimation to be accessible by subsequent processes.
P2SRD14:	N3.6.2.1 The US NDC shall integrate the capability, to be provided as GFE, to transmit calibration and control signals to all AFTAC-controlled sensor stations listed in the US NDC NDDOC.
P2SSS140:	The US NDC classified subsystem shall store origin beams and detection beams for associated detections for each event.
P2SSS146:	The US NDC classified subsystem shall store the results of event identification with other event information for use by subsequent processing and analysis.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS158:	The US NDC classified subsystem shall store the results of each analysis stage.
P2SSS364:	The US NDC shall provide functionality to store all data processing results off-line.
P2SRD16:	N3.7.b The US NDC shall provide access to all data processing results, which have been committed to data, storage.
P2SSS48:	The US NDC classified subsystem shall provide initial Global processing results within 60 minutes of receipt of the seismic waveform data.
P2SSS52:	The US NDC classified subsystem shall provide initial results of Spotlight processing within 30 minutes of the seismic waveform data becoming available.
P2SSS58:	The US NDC classified subsystem shall provide initial results of Forward processing within ten minutes of the seismic waveform data becoming available.
P2SSS66:	The US NDC classified subsystem shall provide functionality to configure Backward processing to suit the regions of interest.
P2SSS107:	The US NDC classified subsystem shall store data quality statistics, detection information and measured features for use by later processing.
P2SSS139:	The US NDC classified subsystem shall store the results of phase identification, association, location and magnitude estimation to be accessible by subsequent processes.
P2SSS146:	The US NDC classified subsystem shall store the results of event identification with other event information for use by subsequent processing and analysis.
P2SSS157:	The US NDC classified subsystem shall provide access to and the functionality to include all available data during analysis, including data not available at the time of previous processing.
P2SRD17:	N3.7.c The US NDC shall automatically process all data from stations listed in the US NDC NDDOC.
P2SSS44:	The US NDC classified subsystem shall continuously perform Global processing.
P2SSS45:	The US NDC classified subsystem shall automatically produce a Global bulletin using seismic and hydroacoustic stations, the latter being included with the hydroacoustic associations being added and seismic events relocated through Event-Driven Processing (EDP).
P2SSS46:	The US NDC classified subsystem shall process and interpret teleseismic and regional seismic data during Global processing.
P2SSS47:	The US NDC classified subsystem shall provide the capacity to simultaneously support up to two Broad Area processing regions within the Global processing pipeline.
P2SSS49:	The US NDC classified subsystem shall provide functionality to execute a Spotlight processing pipeline concentrating on specific source regions.
P2SSS50:	The US NDC classified subsystem shall provide the capacity to support up to eight Spotlight regions as provided by GFE.
P2SSS51:	The US NDC classified subsystem shall provide the capacity to perform Spotlight processing using up to eight seismic stations per Spotlight area as provided by GFE.
P2SSS53:	The US NDC classified subsystem shall support Spotlight regions as large as 1,000,000 square-km as provided by GFE.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS54:	The US NDC classified subsystem shall provide functionality to configure Spotlight processing to suit the regions of interest.
P2SSS55:	The US NDC classified subsystem shall provide functionality to execute a Forward processing pipeline concentrating on specific source regions.
P2SSS56:	The US NDC classified subsystem shall provide the capacity to support up to ten Forward processing regions simultaneously.
P2SSS57:	The US NDC classified subsystem shall provide the capacity to perform Forward processing using up to ten seismic stations per Forward processing region.
P2SSS59:	The US NDC classified subsystem shall notify system operators immediately upon formation of an event in the Forward processing pipeline.
P2SSS60:	The US NDC classified subsystem shall support Forward processing regions as large as 160,000 square-km.
P2SSS61:	The US NDC classified subsystem shall provide the functionality to configure the data processing and display parameters on a station-by-station basis to suit the regions of interest within the Forward processing pipeline.
P2SSS62:	The US NDC classified subsystem shall provide functionality to reprocess data in a limited time window using a Backward processing pipeline.
P2SSS63:	The US NDC classified subsystem shall provide the capacity to perform Backward processing for up to two selected regions simultaneously.
P2SSS64:	The US NDC classified subsystem shall provide temporary storage for Backward processing equivalent to 12 weeks of alphanumeric results from Global processing.
P2SSS65:	The US NDC classified subsystem shall provide the capacity to store up to 48 hours of waveform data from the Global processing network in support of Backward processing.
P2SSS67:	The US NDC classified subsystem shall provide Backward processing results within one minute of completion of processing.
P2SSS68:	The US NDC classified subsystem shall perform detection processing on continuous data from seismic stations.
P2SSS69:	The US NDC classified subsystem shall perform seismic detection processing on data intervals at least two minutes in duration.
P2SSS70:	The US NDC classified subsystem shall automatically apply detection processing to late-arriving data.
P2SSS71:	The US NDC classified subsystem shall perform detection processing on continuous data from hydroacoustic stations.
P2SSS72:	The US NDC classified subsystem shall perform hydroacoustic detection processing on data intervals at least ten minutes in duration.
P2SSS73:	The US NDC classified subsystem shall provide the capacity to process up to 55 hydroacoustic channels at a sample rate of 250 samples per second in the Global pipeline.
P2SSS74:	The US NDC classified subsystem shall provide functionality to configure detection processing parameters on a detector channel-by-detector channel basis.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS75:	The US NDC classified subsystem shall provide functionality to configure detection processing parameters to focus on a specific source region.
P2SSS76:	The US NDC classified subsystem shall obtain site-specific station geometry from the database.
P2SSS77:	The US NDC classified subsystem shall provide functionality to identify and repair single-point spikes in waveform data.
P2SSS78:	The US NDC classified subsystem shall provide functionality to identify and mark data gaps in waveform data.
P2SSS79:	The US NDC classified subsystem shall provide functionality to identify and remove array waveform channels with anomalous amplitudes.
P2SSS80:	The US NDC classified subsystem shall provide functionality to mask data quality control problems that cannot be repaired.
P2SSS81:	The US NDC classified subsystem shall provide functionality to demean input waveform segments.
P2SSS82:	The US NDC classified subsystem shall provide functionality to determine data quality statistics automatically.
P2SSS83:	The US NDC classified subsystem shall provide functionality to form coherent beams at array sites steered to a given azimuth and slowness prior to detection.
P2SSS84:	The US NDC classified subsystem shall provide functionality to form incoherent beams at array sites steered to a given azimuth and slowness prior to detection.
P2SSS85:	The US NDC classified subsystem shall provide functionality to filter raw channels or beams using Butterworth IIR filters prior to detection.
P2SSS86:	The US NDC classified subsystem shall provide functionality to detect signals using the STA/LTA detector.
P2SSS87:	The US NDC classified subsystem shall provide functionality to detect signals using the Z detector.
P2SSS88:	The US NDC classified subsystem shall provide functionality to detect signals using the log-Z detector.
P2SSS89:	The US NDC classified subsystem shall provide functionality to detect signals using the auto-regressive detector as provided by GFE.
P2SSS90:	The US NDC classified subsystem shall provide functionality to detect signals using the F-statistic detector as provided by GFE.
P2SSS91:	The US NDC classified subsystem shall provide functionality to detect signals using the waveform correlation detector as provided by GFE, if this Phase 1 Upgrade capability is available prior to the Build 1 software baseline freeze.
P2SSS92:	The US NDC classified subsystem shall provide functionality to allow insertion of new detector algorithms.
P2SSS93:	The US NDC classified subsystem shall perform signal detection using detection thresholds approved by the Government.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS94:	The US NDC classified subsystem shall provide functionality to identify and cull signal detections occurring on multiple beams.
P2SSS96:	The US NDC classified subsystem shall measure signal back-azimuth and slowness for detected phases at array stations using FK techniques.
P2SSS97:	The US NDC classified subsystem shall determine the F-statistic and estimate uncertainties in measured azimuth and slowness obtained from FK analysis.
P2SSS98:	The US NDC classified subsystem shall measure signal back-azimuth and slowness for P-type phases at three-component stations using polarization techniques.
P2SSS99:	The US NDC classified subsystem shall estimate onset times of detecting short-period signals.
P2SSS100:	The US NDC classified subsystem shall estimate the ratio of signal to noise amplitude for each detected signal.
P2SSS101:	The US NDC classified subsystem shall estimate the dominant period of detected signals.
P2SSS102:	The US NDC classified subsystem shall provide functionality to measure peak-to-trough amplitudes in user specified time windows.
P2SSS103:	The US NDC classified subsystem shall provide functionality to measure amplitude in moving STA windows.
P2SSS104:	The US NDC classified subsystem shall provide functionality to correct amplitude measurements for instrument response at the observed period.
P2SSS105:	The US NDC classified subsystem shall estimate features from hydroacoustic signals as provided by GFE.
P2SSS108:	The US NDC classified subsystem shall automatically perform phase identification in each processing pipeline.
P2SSS109:	The US NDC classified subsystem shall automatically group phases from common events in all processing pipelines.
P2SSS110:	The US NDC classified subsystem shall automatically provide initial phase identification for each detected signal based upon measured features of that detection.
P2SSS111:	The US NDC classified subsystem shall identify teleseismic phases.
P2SSS112:	The US NDC classified subsystem shall automatically differentiate primary and secondary teleseismic phases.
P2SSS113:	The US NDC classified subsystem shall provide functionality to automatically identify local and regional seismic P and S phases in selected regions.
P2SSS114:	The US NDC classified subsystem shall automatically identify hydroacoustic H and T phases.
P2SSS115:	The US NDC classified subsystem shall provide functionality to configure initial phase identification to use station-dependent methods.
P2SSS116:	The US NDC classified subsystem shall automatically group teleseismic signals from a single station that emanates from the same event.
P2SSS117:	The US NDC classified subsystem shall automatically group hydroacoustic signals from a single station that emanates from the same event.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS118:	The US NDC classified subsystem shall automatically associate all signals from a network of seismic stations that emanate from the same event using travel-time prediction and signal features.
P2SSS119:	The US NDC classified subsystem shall provide functionality to automatically refine phase identification after association to an event.
P2SSS120:	The US NDC classified subsystem shall associate a given detection to no more than one event in a given pipeline.
P2SSS121:	The US NDC classified subsystem shall provide functionality to automatically associate hydroacoustic phases to events formed using the seismic technique.
P2SSS122:	The US NDC classified subsystem shall provide functionality to utilize the best path-dependent information available on the system during automatic association.
P2SSS123:	The US NDC classified subsystem shall provide functionality to automatically associate detected signals with existing event hypotheses as those detections become available.
P2SSS124:	The US NDC classified subsystem shall retain event hypotheses meeting configurable acceptance criteria.
P2SSS125:	The US NDC classified subsystem shall provide functionality to automatically locate events using signal arrival time, back azimuth and slowness.
P2SSS126:	The US NDC classified subsystem shall automatically locate all events satisfying configurable minimum-data criteria.
P2SSS127:	The US NDC classified subsystem shall provide functionality to automatically locate events using seismic signals, hydroacoustic signals or combinations thereof.
P2SSS128:	The US NDC classified subsystem shall automatically locate events at depth for events satisfying configurable criteria.
P2SSS129:	The US NDC classified subsystem shall estimate uncertainties in all computed locations, including predicted data residuals.
P2SSS130:	The US NDC classified subsystem shall provide functionality to use the best available information in the US NDC system for automatic location.
P2SSS131:	The US NDC classified subsystem shall provide functionality to use travel-time correction surfaces and regional travel-time tables provided by GFE for automatic location.
P2SSS132:	The US NDC classified subsystem shall automatically determine event magnitudes for all located events with sufficient amplitude measurements for the purpose of characterizing the event source.
P2SSS133:	The US NDC classified subsystem shall automatically determine mb.
P2SSS134:	The US NDC classified subsystem shall provide functionality to determine maximum-likelihood estimates of mb and Ms.
P2SSS135:	The US NDC classified subsystem shall provide functionality to automatically determine regional magnitude in selected regions, as provided by GFE.
P2SSS136:	The US NDC classified subsystem shall provide functionality to configure regional magnitude processing to selected regions of interest.
P2SSS137:	The US NDC classified subsystem shall estimate the uncertainties of all computed magnitudes.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS138:	The US NDC classified subsystem shall provide functionality to use the best available attenuation information in the US NDC system for automatic magnitude determination.
P2SSS141:	The US NDC classified subsystem shall perform post-analysis event identification.
P2SSS142:	The US NDC classified subsystem shall provide functionality to perform event identification in the Global processing pipeline.
P2SSS143:	The US NDC classified subsystem shall classify events using teleseismic discriminants consistent with the rules given in "Event Classification Procedures for the Seismic Technique (REF 11)", dated 5 April 1982.
P2SSS144:	The US NDC classified subsystem shall determine if an event is located within the Area-Of-Interest (AOI) and store that designation with other event information.
P2SSS145:	The US NDC classified subsystem shall provide functionality to modify the AOI to meet changing mission objectives.
P2SSS159:	The US NDC classified subsystem shall provide functionality to automatically prepare origin beams for array sensor stations, in the predicted arrival time window and steered to an event, for display during analysis.
P2SSS160:	The US NDC classified subsystem shall provide functionality to automatically determine hydroacoustic azimuths in preparation for analysis.
P2SSS161:	The US NDC classified subsystem shall provide functionality to perform automatic processing between each stage of analysis.
P2SSS188:	The US NDC classified subsystem shall provide functionality to automatically determine signal-to-noise ratios for analyst-added detections.
P2SSS203:	The US NDC classified subsystem shall provide functionality to generate bulletins for all processing modes.
P2SSS204:	The US NDC classified subsystem shall provide functionality to generate bulletins after all processing stages, in automated processing and in interactive analysis, that result in event forming.
P2SSS205:	The US NDC classified subsystem shall provide functionality to generate event bulletins containing information about the network solution (latitude, longitude, time, depth, magnitude) and information about station associations.
P2SSS206:	The US NDC classified subsystem shall perform comparisons between two bulletins that will identify common events and characterize the differences in their solutions.
P2SSS207:	The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using event information.
P2SSS208:	The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using both event and arrival information.
P2SSS467:	The US NDC classified subsystem shall automatically perform long-period signal detection and processing through Event-Driven Processing (EDP), to associate long-period phases to events formed using short-period seismic signals, if this Phase 1 Upgrade capability is available prior to the Build 1 software baseline freeze.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS484:	The US NDC classified subsystem shall provide the functionality to make measurements on processed and unprocessed data.
P2SSS488:	The US NDC classified subsystem shall provide functionality to allow the insertion of new types of filters.
P2SSS489:	The US NDC classified subsystem shall provide functionality to allow insertion of new algorithms for data quality control.
P2SSS490:	The US NDC classified subsystem shall automatically group regional seismic signals from a single station that emanates from the same event.
P2SSS514:	In the event of an outage, the US NDC Global station processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration) ratio, under non-swarm conditions.
P2SSS515:	In the event of an outage, the US NDC Global network processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration) ratio, under non-swarm conditions.
P2SSS516:	In the event of an outage, the US NDC Spotlight station processing intervals shall successfully complete at no less than a 2:1 (data duration/processing duration ratio), under non-swarm conditions.
P2SSS517:	The US NDC Backward processing intervals shall successfully complete at no less than a 1:1 (data duration/processing duration) ratio, under non-swarm conditions.
P2SSS534:	The US NDC classified subsystem shall provide the functionality to configure the data processing and display parameters on a station-by-station basis to suit the Broad-Area processing regions of interest within the Global processing pipeline.
P2SRD18:	N3.8.a The US NDC shall provide an interactive analysis capability to review, refine, correct, and/or display current results, regardless of whether they have been generated directly from the automated processing system or have been previously analyzed.
P2SSS151:	The US NDC classified subsystem shall provide functionality to review the results of all automatic processing.
P2SSS152:	The US NDC classified subsystem shall provide interactive functionality to edit the results of all automatic processing.
P2SSS153:	The US NDC classified subsystem shall provide interactive functionality to edit stored analysis results.
P2SSS154:	The US NDC classified subsystem shall provide functionality to compare results of automatic processing to all analyzed results.
P2SSS155:	The US NDC classified subsystem shall retain all original processing results when edited.
P2SSS156:	The US NDC classified subsystem shall permit analysis of results without impact to automatic processing.
P2SSS162:	The US NDC classified subsystem shall provide functionality to display data for each waveform type individually by technique.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS163:	The US NDC classified subsystem shall provide functionality to manipulate waveform data, including scrolling, zooming and filtering of the data.
P2SSS164:	The US NDC classified subsystem shall provide functionality to edit any measurement used for location, magnitude or discriminant analysis.
P2SSS165:	The US NDC classified subsystem shall provide functionality to modify phase identification of data used for event location.
P2SSS166:	The US NDC classified subsystem shall provide interactive functionality to compute event location.
P2SSS167:	The US NDC classified subsystem shall automatically compute, display, and save event location results for depth constrained to the surface of the earth, depth unconstrained, and a user-selected depth, and use the results in subsequent processing.
P2SSS168:	The US NDC classified subsystem shall provide interactive functionality to select those data that are defining for event location.
P2SSS169:	The US NDC classified subsystem shall provide functionality for specifying user-selected location parameters.
P2SSS170:	The US NDC classified subsystem shall provide functionality to specify travel-time tables used for location.
P2SSS171:	The US NDC classified subsystem shall provide functionality to select any available regionalized corrections to travel-times tables.
P2SSS172:	The US NDC classified subsystem shall provide functionality to perform event location using test-site travel-time corrections.
P2SSS173:	The US NDC classified subsystem shall provide interactive functionality to compute all event magnitudes used in the system.
P2SSS174:	The US NDC classified subsystem shall provide interactive functionality to select those data that are defining for event magnitude, while preserving all individual station magnitudes.
P2SSS175:	The US NDC classified subsystem shall provide interactive functionality to allow user selection of magnitude parameters.
P2SSS176:	The US NDC classified subsystem shall provide functionality to specify attenuation tables used for magnitude.
P2SSS177:	The US NDC classified subsystem shall provide functionality to compute magnitude using test-site magnitude corrections.
P2SSS178:	The US NDC classified subsystem shall provide functionality to use all automatic processing algorithms during interactive analysis.
P2SSS179:	The US NDC classified subsystem shall provide functionality to interactively generate origin and detection beams.
P2SSS180:	The US NDC classified subsystem shall provide functionality to form beams for three-component data using polarization techniques.
P2SSS181:	The US NDC classified subsystem shall provide functionality to modify detection beam parameters.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS182:	The US NDC classified subsystem shall by default generate beams with parameters identical to those used in automatic processing.
P2SSS183:	The US NDC classified subsystem shall provide interactive functionality to determine back azimuth and apparent velocity from array data using FK analysis.
P2SSS184:	The US NDC classified subsystem shall provide functionality to modify parameters controlling FK analysis.
P2SSS185:	The US NDC classified subsystem shall provide functionality to determine back azimuth and apparent velocity for P- and LR-type waves from three-component seismic stations using polarization analysis.
P2SSS186:	The US NDC classified subsystem shall provide functionality to interactively review hydroacoustic azimuths determined in pre-analysis processing.
P2SSS187:	The US NDC classified subsystem shall provide functionality to automatically perform event formation using user-selected detections.
P2SSS189:	The US NDC classified subsystem shall provide functionality for reviewing selected seismic discrimination results.
P2SSS190:	The US NDC classified subsystem shall provide interactive functionality for selection of those data used in seismic discriminant analysis.
P2SSS191:	The US NDC classified subsystem shall provide interactive functionality to modify discrimination results.
P2SSS192:	The US NDC classified subsystem shall provide functionality for reviewing hydroacoustic discrimination results, as provided by GFE.
P2SSS193:	The US NDC classified subsystem shall provide interactive functionality for selection of those data used in hydroacoustic discriminant analysis, as provided by GFE.
P2SSS194:	The US NDC classified subsystem shall provide functionality to review the results of event identification.
P2SSS195:	The US NDC classified subsystem shall provide functionality for user-selection of discriminants to be used in event identification.
P2SSS203:	The US NDC classified subsystem shall provide functionality to generate bulletins for all processing modes.
P2SSS204:	The US NDC classified subsystem shall provide functionality to generate bulletins after all processing stages, in automated processing and in interactive analysis, that result in event forming.
P2SSS205:	The US NDC classified subsystem shall provide functionality to generate event bulletins containing information about the network solution (latitude, longitude, time, depth, magnitude) and information about station associations.
P2SSS206:	The US NDC classified subsystem shall perform comparisons between two bulletins that will identify common events and characterize the differences in their solutions.
P2SSS207:	The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using event information.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS208:	The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using both event and arrival information.
P2SSS211:	The US NDC classified subsystem shall provide functionality to evaluate the performance of data processing functions using specified metrics.
P2SSS215:	The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical comparisons between stored results from any processing stage in any pipeline mode of the US NDC.
P2SSS216:	The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical bulletin comparisons between stored results of the US NDC and other operational systems whose results are stored using the applicable version of the US NDC Database Schema.
P2SSS236:	The US NDC classified subsystem shall provide functionality to perform statistical evaluations of automated events that are not validated (false alarms).
P2SSS237:	The US NDC classified subsystem shall provide functionality to perform statistical evaluations of missed events and missed associations.
P2SSS238:	The US NDC classified subsystem shall provide functionality to perform statistical evaluations of events common to the automated bulletin and an analyst-reviewed bulletin.
P2SSS411:	The US NDC classified subsystem shall provide the functionality to interactively process acquired waveform data from auxiliary seismic stations, if this Phase 1 Upgrade functionality is available prior to the Build 1 software baseline freeze.
P2SSS483:	The US NDC classified subsystem shall provide the functionality to prepare teleseismic and regional beams for short-period, broadband and long-period seismic signals, for display during analysis.
P2SSS485:	The US NDC classified subsystem shall provide the functionality to interactively initiate all Event-Driven Processing (EDP) functions.
P2SSS492:	The US NDC classified subsystem shall provide the functionality to automatically prepare detection beams for array sensor stations, from frequency-wave number (FK) processing, for display during analysis.
P2SRD19:	N3.9.a The US NDC shall provide the capability to automatically generate reports for all events.
P2SSS203:	The US NDC classified subsystem shall provide functionality to generate bulletins for all processing modes.
P2SSS204:	The US NDC classified subsystem shall provide functionality to generate bulletins after all processing stages, in automated processing and in interactive analysis, that result in event forming.
P2SSS205:	The US NDC classified subsystem shall provide functionality to generate event bulletins containing information about the network solution (latitude, longitude, time, depth, magnitude) and information about station associations.
P2SSS206:	The US NDC classified subsystem shall perform comparisons between two bulletins that will identify common events and characterize the differences in their solutions.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS207:	The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using event information.
P2SSS208:	The US NDC classified subsystem shall provide functionality to perform bulletin comparisons using both event and arrival information.
P2SRD20:	N3.10.a The US NDC shall provide short-term (less than 45 days) on-line storage; long-term (45-180 days) near-line storage; and permanent (over 180 days) off-line storage of all data from the data origination date.
P2SSS304:	The US NDC shall automatically backup all on-line waveform data.
P2SSS305:	The US NDC shall automatically backup all off-line waveform data.
P2SSS306:	The US NDC shall automatically backup all alphanumeric data.
P2SSS307:	The US NDC automated backup functionality shall be capable of running concurrently with automated data acquisition, data processing, and data storage functions.
P2SSS308:	The US NDC shall incorporate functionality to restore all backup waveform data.
P2SSS309:	The US NDC classified subsystem shall restore all backup alphanumeric data.
P2SSS346:	The US NDC unclassified subsystem shall have the capacity to store waveform data as characterized in Table 1 for up to 13 days in on-line short-term storage.
P2SSS349:	The US NDC classified subsystem shall have the capacity to store waveform data characterized in Table 1 for at least 45 days in on-line short-term storage.
P2SSS350:	The US NDC unclassified subsystem shall have the capacity to store waveform data as characterized in Table 1 for at least 180 days in on-line long-term storage.
P2SSS351:	The US NDC classified subsystem shall have the capacity to store waveform data as characterized in Table 1 for at least 60 days in on-line long-term storage.
P2SSS356:	The US NDC classified subsystem shall have the capacity to store waveform data characterized in Table 1 and associated waveform descriptor records over 180 days old for the life of the system in off-line permanent storage.
P2SSS357:	The US NDC shall store all waveform and alphanumeric data on portable permanent storage media.
P2SSS361:	The US NDC unclassified subsystem shall have a database with the table space capacity to store 180 days of alphanumeric wfdisc records on-line.
P2SSS362:	The US NDC unclassified subsystem database shall have the table space capacity to store 180 days of alphanumeric IDC bulletin data on-line.
P2SSS363:	The US NDC classified subsystem shall have a database with the table space capacity to store all alphanumeric data processing and analysis records on-line for the life of the system.
P2SSS364:	The US NDC shall provide functionality to store all data processing results off-line.
P2SSS510:	The US NDC permanent storage system shall not rely on a proprietary database management system for access.
P2SSS535:	The US NDC shall use a flat-file format for permanent storage.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SRD21:	N3.10.b The US NDC shall provide a minimum of eight hours of unclassified and eight hours of classified buffer storage capability for all incoming data.
P2SSS358:	The US NDC unclassified subsystem shall have the capacity to buffer at least 8 hours of all incoming waveform data, as characterized in Table 1.
P2SSS359:	The US NDC classified subsystem shall have the capacity to buffer at least 8 hours of all incoming waveform data, as characterized in Table 1.
P2SRD22:	N3.11.a The US NDC shall provide the capability to automatically and interactively monitor data processing functions.
P2SSS38:	The US NDC shall automatically monitor the timing of acquired waveform data intervals by measuring the latency time between data recorded at the sensor and acquired at the front-end of the US NDC by using McTool, WorkFlow, and PerfMon.
P2SSS39:	The US NDC shall automatically monitor and log missing waveform data.
P2SSS209:	The US NDC classified subsystem shall provide functionality to automatically monitor data processing functions.
P2SSS210:	The US NDC classified subsystem shall provide functionality to interactively monitor data processing functions through a GUI.
P2SSS211:	The US NDC classified subsystem shall provide functionality to evaluate the performance of data processing functions using specified metrics.
P2SSS214:	The US NDC classified subsystem shall provide functionality to automatically collect historical averages of station detection rates.
P2SSS215:	The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical comparisons between stored results from any processing stage in any pipeline mode of the US NDC.
P2SSS216:	The US NDC classified subsystem shall provide functionality to configure parameters so as to perform statistical bulletin comparisons between stored results of the US NDC and other operational systems whose results are stored using the applicable version of the US NDC Database Schema.
P2SSS218:	The US NDC classified subsystem shall provide functionality to interactively customize performance monitoring reports, including selection of time windows and comparisons to include.
P2SSS219:	The US NDC classified subsystem shall provide functionality to display in color a generated performance report.
P2SSS220:	The US NDC classified subsystem shall provide functionality to generate color copies on paper and transparencies of a generated performance report.
P2SSS221:	The US NDC classified subsystem shall provide functionality to monitor the timeliness of data acquisition and processing milestones on the classified subsystem.
P2SSS222:	The US NDC classified subsystem shall provide functionality to monitor the availability of expected data on the classified subsystem, for stations that are processed.
P2SSS223:	The US NDC classified subsystem shall provide functionality to monitor the quality of acquired data, including percentage of data masked due to spikes or drop-outs, and the number of masked segments, for stations that are processed.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS224:	The US NDC classified subsystem shall provide functionality to monitor station noise levels for acquired data, for stations that are processed.
P2SSS225:	The US NDC classified subsystem shall provide functionality to monitor station detection thresholds using Chi-square analysis.
P2SSS226:	The US NDC classified subsystem shall provide functionality to monitor station detection rates.
P2SSS227:	The US NDC classified subsystem shall provide functionality to monitor the rates of associated automated detections and of analyst-added phases.
P2SSS228:	The US NDC classified subsystem shall provide functionality to monitor the accuracy of amplitude and period measurements.
P2SSS229:	The US NDC classified subsystem shall provide functionality to monitor the accuracy of slowness estimation through statistical analysis of slowness residuals.
P2SSS230:	The US NDC classified subsystem shall provide functionality to monitor the accuracy of azimuth estimation through statistical analysis of azimuth residuals.
P2SSS231:	The US NDC classified subsystem shall provide functionality to monitor the accuracy of arrival time estimation through statistical analysis of time residuals.
P2SSS233:	The US NDC classified subsystem shall provide functionality to monitor the accuracy of initial phase identification.
P2SSS234:	The US NDC classified subsystem shall provide functionality to monitor the accuracy of final phase identification after event location.
P2SSS235:	The US NDC classified subsystem shall provide functionality to monitor the performance of hydroacoustic event-driven processing.
P2SSS236:	The US NDC classified subsystem shall provide functionality to perform statistical evaluations of automated events that are not validated (false alarms).
P2SSS237:	The US NDC classified subsystem shall provide functionality to perform statistical evaluations of missed events and missed associations.
P2SSS238:	The US NDC classified subsystem shall provide functionality to perform statistical evaluations of events common to the automated bulletin and an analyst-reviewed bulletin.
P2SSS239:	The US NDC classified subsystem shall provide functionality to monitor the use of locating phases in interactive analysis, including teleseismic branches, regional phases and depth phases.
P2SSS240:	The US NDC classified subsystem shall provide interactive functionality to monitor the retiming of arrivals in interactive analysis.
P2SSS241:	The US NDC classified subsystem shall provide interactive functionality to monitor the association and disassociation of automated detections in interactive analysis.
P2SRD23:	N3.11.b The US NDC shall provide the capability to automatically and manually generate performance monitoring reports.
P2SSS212:	The US NDC classified subsystem shall provide functionality to automatically generate performance monitoring reports as regularly scheduled products.
P2SSS213:	The US NDC classified subsystem shall provide interactive functionality to generate performance monitoring reports.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS217:	The US NDC classified subsystem shall provide functionality to generate graphical displays of bulletin comparisons, including event maps and graphs of location differences.
P2SSS232:	The US NDC classified subsystem shall provide functionality to graphically display the geographic, depth and magnitude distributions of events formed by the automated processing or after analyst review.
P2SRD24:	N3.12.a The US NDC shall integrate the capability, to be provided as GFE, to use geographically referenced information required for data processing (e.g., political boundaries, areas of interest, regional seismic phase attenuation and blockage, sensor station locations, etc.).
P2SSS196:	The US NDC classified subsystem shall provide functionality to automatically access, spatially manipulate, and spatially process geographically referenced information required for data processing provided by GFE.
P2SSS197:	The US NDC classified subsystem shall provide functionality to store, manage, maintain, analyze, and manipulate spatial data as provided by GFE.
P2SSS198:	The US NDC classified subsystem shall provide the functionality to maintain change control of geographical information in the system, including the history of data updates and modifications, as provided by GFE.
P2SSS199:	The US NDC classified subsystem shall provide functionality to display and process geographical information as provided by GFE.
P2SSS200:	The US NDC classified subsystem shall provide functionality to display event, detection and station information in conjunction with spatial data.
P2SSS201:	The US NDC classified subsystem shall provide interactive functionality to manipulate and process spatial data as provided by GFE.
P2SSS202:	The US NDC classified subsystem shall provide functionality to generate high quality graphical and tabular presentations of the results of spatial processing of geographical data as provided by GFE.
P2SRD25:	N3.12.b The US NDC shall integrate software tools and functions, to be provided as GFE, which automatically and interactively access, spatially manipulate, and spatially process geographically referenced data.
P2SSS196:	The US NDC classified subsystem shall provide functionality to automatically access, spatially manipulate, and spatially process geographically referenced information required for data processing provided by GFE.
P2SSS197:	The US NDC classified subsystem shall provide functionality to store, manage, maintain, analyze, and manipulate spatial data as provided by GFE.
P2SSS198:	The US NDC classified subsystem shall provide the functionality to maintain change control of geographical information in the system, including the history of data updates and modifications, as provided by GFE.
P2SSS199:	The US NDC classified subsystem shall provide functionality to display and process geographical information as provided by GFE.
P2SSS201:	The US NDC classified subsystem shall provide interactive functionality to manipulate and process spatial data as provided by GFE.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS202:	The US NDC classified subsystem shall provide functionality to generate high quality graphical and tabular presentations of the results of spatial processing of geographical data as provided by GFE.
P2SRD26:	N3.13.a The US NDC shall provide software tools to support tuning and evolution of geophysical performance.
P2SSS147:	The US NDC classified subsystem shall provide functionality to train neural networks for initial wave-type identification.
P2SSS148:	The US NDC classified subsystem shall provide functionality to compute new Bayesian inference tables for regional phase identification from historical data.
P2SSS149:	The US NDC classified subsystem shall provide functionality to create and view grid files used in automated network association.
P2SSS150:	The US NDC classified subsystem shall provide documentation to assist in testing and understanding the functions and primary configuration parameters of the system used for automated network association.
P2SRD27:	N4.1.a The expected service life of all US NDC operational platform hardware components shall be five years from the conclusion of Phase 2 System Acceptance Testing.
P2SSS376:	The US NDC shall incorporate the Oracle Server Enterprise Edition product, version 8.1.7.
P2SSS502:	The US NDC hardware purchased after Phase 2 Build 1 CDR shall have a 5-year service life from the conclusion of Phase 2 Build 1 SAT.
P2SRD28:	N4.2.a The US NDC shall support a mission duration of 24 hours per day, 7 days per week, 365 days per year.
P2SSS382:	The US NDC shall have a mission profile of operating 52 weeks per year, 7 days per week and 24 hours per day.
P2SRD29:	N4.3.a The US NDC shall provide a minimum operational availability of 99%. Operational availability is defined as $MTBCF/(MTBCF + MRT)$. Mean Restoration Time (MRT) - the time to restore the subsystem to an operational condition after a critical failure and includes notification, response, supply, administration, and maintenance. Mean Time Between Critical Failures (MTBCF) - the time between critical failures. A critical failure implies that a portion of the US NDC hardware and/or software is unable to collect or process required data. Any of the following conditions constitutes a US NDC critical system failure: The inability of the US NDC to continuously process data from any sensor station identified as essential to monitoring within one hour of data acquisition at the station. The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 98% data accuracy and within 15 minutes of data acquisition at the station. The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 97% data timeliness and within five minutes of data acquisition at the station. The inability of the US NDC spotlight and forward processing pipelines to identify and report an explosion within one hour of data acquisition at the station.
P2SSS395:	A sparing analysis shall be conducted after CDR by a joint Government and Contractor team. MCH will be evaluated for suitable sparing levels to support mission availability requirements.
P2SSS399:	The US NDC shall provide a minimum operational availability of 99%.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SRD30:	N4.3.b The US NDC shall provide a minimum MTBCF of 2160 hours (90 days).
P2SSS381:	The US NDC shall have a hardware mission MTBCF of no less than 2160 hours when operating in an environment specified in Section 3.9 of this document. The MTBCF parameter is based on MCH.
P2SRD31:	N4.3.c The US NDC shall provide an MRT of 21.8 hours.
P2SSS383:	The US NDC hardware MRT shall be 21.8 hours. The MRT parameter is based on MCH.
P2SRD32:	N4.3.d No repair action mitigating a US NDC critical failure shall exceed four hours.
P2SSS397:	The US NDC repair time for MCH failures shall not exceed 4 hours.
P2SRD33:	N4.3.e The US NDC shall be designed to ensure 95% of repairs are made in less than two hours.
P2SSS384:	The US NDC shall have a hardware MTTR of less than two hours at the 95th percentile.
P2SRD34:	N4.4.a The US NDC shall be designed for a two-level maintenance concept.
P2SSS385:	The US NDC shall be designed for organizational and depot levels of maintenance.
P2SRD35:	N4.4.b The US NDC shall exhibit a minimum time between preventative maintenance routines (PMRs) of 720 hours.
P2SSS387:	The US NDC shall achieve a minimum time between preventive maintenance routines (PMRs) of 720 hours.
P2SRD36:	N4.4.c No US NDC PMR shall require a system outage such that a critical failure situation (as defined in requirement N4.3.a) occurs.
P2SSS388:	The US NDC shall not have system outages due to PMRs.
P2SRD37:	N4.5.a All US NDC critical failures (as defined in paragraph N4.3.a) shall be automatically detected and reported.
P2SSS386:	The US NDC shall provide functionality to automatically monitor, collect, and report fault information.
P2SSS393:	All US NDC detected hardware faults shall be isolated to one LRU as directed by the COTS Field Engineering Handbook for the given hardware system using a combination of automatic fault isolation and interactive troubleshooting.
P2SRD38:	N4.5.b All detected faults shall be isolated to one LRU using a combination of automatic fault isolation and manual troubleshooting procedures contained in the system technical documentation.
P2SSS389:	The US NDC COTS hardware selection shall consider fault detection and isolation capabilities to maximize MCH failure detection and reporting.
P2SSS393:	All US NDC detected hardware faults shall be isolated to one LRU as directed by the COTS Field Engineering Handbook for the given hardware system using a combination of automatic fault isolation and interactive troubleshooting.
P2SRD39:	N4.5.c The US NDC shall detect and report the loss of a storage device.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS386:	The US NDC shall provide functionality to automatically monitor, collect, and report fault information.
P2SSS390:	The US NDC shall detect and report the loss of a storage device.
P2SSS391:	The US NDC shall maximize the use of storage devices (controller modules, disk trays, drives, etc.) that have the capabilities of automatic failover and hot spare.
P2SSS393:	All US NDC detected hardware faults shall be isolated to one LRU as directed by the COTS Field Engineering Handbook for the given hardware system using a combination of automatic fault isolation and interactive troubleshooting.
P2SRD40:	N4.5.d The US NDC shall automatically switch to an alternate storage device to allow for continued system operations in the event of a storage device failure.
P2SSS391:	The US NDC shall maximize the use of storage devices (controller modules, disk trays, drives, etc.) that have the capabilities of automatic failover and hot spare.
P2SSS521:	The US NDC shall support the use of an alternate storage device to allow for continued system operations in the event of a storage device failure.
P2SRD41:	N4.5.e The US NDC shall provide a graphical display of US NDC system status by monitoring and reporting the health of US NDC critical hardware and software components in a real-time environment.
P2SSS386:	The US NDC shall provide functionality to automatically monitor, collect, and report fault information.
P2SRD42:	N4.5.f The US NDC shall allow for data recovery in the event of storage device failure.
P2SSS392:	The US NDC shall allow for data recovery in the event of storage device failure.
P2SRD43:	N4.6.a The US NDC shall be designed to enable LRU removal, replacement, and reinstallation within one hour without loss of data or system integrity.
P2SSS394:	The US NDC shall be designed to enable LRU removal, replacement, and reinstallation within one hour.
P2SSS396:	The US NDC data storage function shall be designed so that individual storage devices may be removed and replaced without loss of data or system integrity.
P2SRD44:	N4.7.a The US NDC shall provide the capability to automatically monitor, collect, and report fault information.
P2SSS386:	The US NDC shall provide functionality to automatically monitor, collect, and report fault information.
P2SSS389:	The US NDC COTS hardware selection shall consider fault detection and isolation capabilities to maximize MCH failure detection and reporting.
P2SRD45:	N4.8.a The US NDC shall maximize the use of interchangeable workstations, LRUs, and circuit card assemblies (CCAs).
P2SSS398:	The US NDC shall maximize the use of interchangeable workstations, LRUs and other interchangeable hardware.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SRD46:	N4.9.a The US NDC shall operate at a noise level in accordance with the Occupational Safety and Health Administration (OSHA) guidelines for an office environment.
P2SSS332:	The US NDC shall provide hardware components specified to produce no more than 85db acoustic noise while operating.
P2SRD47:	N5.1.a The US NDC shall acquire, process, and store data up to the DoD SECRET level.
P2SSS313:	The US NDC shall acquire, process and store data up to the Department of Defense (DoD) Secret level in accordance with (IAW) DAA approved Air Force Manual 33-229, 1 November 1997, Controlled Access Protection (CAP) for Information Security Systems (IS).
P2SRD48:	N5.1.b The US NDC shall have the mechanisms to protect itself from external access by unauthorized personnel.
P2SSS314:	The US NDC shall be connected to external interfaces by way of an AFTAC provided firewall to protect it from external access by unauthorized personnel.
P2SRD49:	N5.1.c The US NDC shall limit external access to selected portions of the system to authorized users.
P2SSS315:	The US NDC shall verify user identity prior to gaining access to the US NDC.
P2SSS320:	The US NDC shall limit remote system access to specific authorized lists of users on specific authorized machines IAW the discretionary access procedures established in the CAP.
P2SSS321:	The US NDC shall protect the integrity of data from unauthorized modification.
P2SRD50:	N5.1.d The US NDC shall provide security measures to protect against inadvertent or deliberate release of classified data to unauthorized personnel.
P2SSS316:	The US NDC shall prevent the inadvertent disclosure of information to unauthorized users by protecting primary storage, fixed media, removable media, etc. IAW the object reuse requirements of the CAP for IS systems.
P2SRD51:	N5.2.a The US NDC architecture shall comply with all security standards levied down by appropriate DAA.
P2SSS317:	The US NDC shall segregate configuration files containing classified or sensitive information into clearly marked directories.
P2SSS318:	The US NDC shall comply with security standards IAW the CAP for legacy systems.
P2SSS319:	The US NDC shall employ security measures to prevent files containing classified information from being transmitted to the unclassified subsystem.
P2SSS322:	The US NDC shall provide dependable audit capabilities that have the ability to selectively acquire and support tracing events to specific users.
P2SSS323:	The US NDC shall require identification and authentication of all users attempting to log on to the system IAW the CAP for legacy systems.
P2SSS324:	The US NDC shall provide warning banners advising users of system monitoring activities prior to completion of user login as part of the CAP auditing functionality.
P2SSS325:	The US NDC shall provide one-way data flow from the unclassified to the classified subsystem.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS326:	The US NDC shall provide system security protection for all message transfers from the classified to the unclassified subsystem.
P2SRD52:	N6.1.a The US NDC system shall be capable of operating in a normal office environment with local power, 110-120/220-240 volts AC, 60 Hz, single phase, and shall be robust enough to handle voltage irregularities and power loss without damaging the system and/or losing stored data.
P2SSS327:	The hardware components of the US NDC shall provide hardware capable of operating with 110-120/220-240 volts AC, 60 Hz, single/three phase power.
P2SSS328:	The US NDC shall operate from the facility uninterruptible power supply (UPS) system to protect the COTS hardware from damaging voltage irregularities and power loss.
P2SSS519:	The US NDC Training System shall operate from an uninterruptible power supply (UPS) system to protect the COTS hardware from damaging voltage irregularities and power loss.
P2SRD53:	N6.1.b The US NDC shall be capable of sustained operation over the temperature range of 60-90° F.
P2SSS329:	The US NDC shall provide hardware components specified to operate within the temperature range of 60 to 90 degrees Fahrenheit.
P2SRD54:	N6.1.c The US NDC shall be capable of sustained operation over the relative humidity range of 20-80%.
P2SSS330:	The US NDC hardware components shall be specified to operate within the relative humidity range of 20% to 80%, non-condensing.
P2SRD55:	N6.1.1.a The US NDC shall have the capability to perform an orderly shutdown when notified of an imminent power loss and/or if the operating temperature exceeds 90° F.
P2SSS333:	The US NDC shall provide the functions to perform orderly shutdown and startup.
P2SSS334:	The US NDC shall provide functionality to restart each workstation individually without affecting the operation of other workstations in the system.
P2SRD56:	N6.2.a The computer hardware elements of the US NDC system shall meet commercial standards and shall not fail due to electrostatic discharges produced by proper handling, operation, and maintenance of the system.
P2SSS335:	The US NDC hardware elements shall meet commercial standards for electrostatic discharge.
P2SRD57:	N6.3.a The US NDC computer hardware shall comply with Part 15 of Federal Communications Commission (FCC) rules for Class A digital devices.
P2SSS332:	The US NDC shall provide hardware components specified to produce no more than 85db acoustic noise while operating.
P2SSS336:	The US NDC computer hardware shall comply with Part 15 of the Federal Communications Commission (FCC) rules for Class A or Class B digital devices.
P2SRD58:	N6.4.a The US NDC shall comply with the requirements of applicable regulations promulgated by federal regulatory agencies governing toxic products and hazardous materials.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS311:	The US NDC shall be composed of COTS hardware that does not require the use of toxic products or hazardous materials during normal operation or preventive maintenance tasks.
P2SRD59:	N6.5.a The US NDC shall not include, or require the use of, volatile organic compounds restricted by regional air quality regulations.
P2SSS312:	The US NDC shall be composed of COTS hardware that does not contain volatile organic compounds (VOCs), or require the use of VOCs for normal operation or to perform preventive maintenance procedures.
P2SRD60:	N6.6.a The US NDC shall be designed to support introduction of upgraded software/hardware, functionality, and additional processing capacity without unplanned loss of previous capabilities.
P2SSS410:	The US NDC shall be designed to have its hardware and software incrementally upgraded over its operational lifetime, including the ability to add functionality, increase processing capacity, and increase memory storage capacity without unplanned loss of previous capabilities.
P2SRD61:	N7.0.a The US NDC software shall be written in high order programming languages, minimizing the number of languages.
P2SSS372:	The US NDC software shall be written in high order programming languages, minimizing the number of languages.
P2SRD62:	N7.0.b The US NDC shall make maximum use of commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) software.
P2SSS373:	The US NDC shall make maximum use of COTS and Government off the Shelf (GOTS) software.
P2SSS375:	The US NDC shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the US NDC without interruptions.
P2SSS493:	The US NDC databases shall employ appropriate techniques (for example, check constraints or triggers) to prevent the entry of out-of-range data.
P2SSS495:	The US NDC databases shall prevent the entry of duplicate data records.
P2SSS496:	The US NDC databases shall enforce parent-child relationships between tables where appropriate.
P2SSS497:	Users of US NDC databases shall be granted privileges appropriate to their level of access by means of pre-defined roles.
P2SSS498:	The US NDC Oracle databases shall implement session-level temporary tables where appropriate.
P2SSS526:	The US NDC databases shall prevent entry of data records into child tables unless the appropriate matching records exist in the parent tables.
P2SSS527:	The US NDC databases shall ensure that related records in child tables are deleted whenever records in parent tables are deleted.
P2SSS528:	Attempts by US NDC applications software to enter duplicate data records, invalid child records or out-of-range data into the US NDC databases shall be logged to application level log files.
P2SSS529:	The US NDC databases shall prevent entry of data records into child tables unless the appropriate matching records exist in the parent tables.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS530:	The US NDC shall ensure that related records in child tables are deleted whenever records in parent tables are deleted.
P2SSS531:	Attempts by US NDC applications software to enter duplicate data records, invalid child records or out-of-range data into the US NDC databases shall be logged to application level log files.
P2SRD63:	N8.0.a The US NDC software shall have a uniform and consistent user interface for access to all the processing capability within the US NDC.
P2SSS374:	The US NDC shall have software with a uniform and consistent user interface for access to all the interactive processing functionality within the US NDC.
P2SRD64:	N9.0.a The US NDC Training Subsystem shall reliably simulate US NDC operations, and support the school's effort to provide personnel capable of performing to AFTAC standards in this critical environment.
P2SSS242:	The US NDC Training System shall provide all analysis tools available in the US NDC classified subsystem.
P2SSS243:	The US NDC Training System shall provide the instructor with access to all analysis and maintenance functions.
P2SSS244:	The US NDC Training System shall provide compatible software to allow interaction between student and instructor workstations for both analysis and computer-assisted instruction.
P2SSS245:	The US NDC Training System shall project instructor workstation activities to student workstation displays.
P2SSS246:	The US NDC Training System shall project student activities to the instructor workstation display.
P2SSS247:	The US NDC Training System shall provide functionality to execute processes for analysis data preparation and student account management from the instructor workstation.
P2SSS248:	The US NDC Training system shall provide functions necessary to interrupt processes for analysis data preparation and student account management from the instructor workstation.
P2SSS249:	The US NDC Training System shall notify the instructor of the failure of processes for analysis data preparation and student account management.
P2SSS250:	The US NDC Training System shall log all processes for analysis data preparation and student account management.
P2SSS251:	The US NDC Training System shall automatically store all classified data processing results.
P2SSS252:	The US NDC Training System shall provide the functions necessary to automatically generate detection beams using parameters derived from frequency-wave number analysis.
P2SSS253:	The US NDC Training System shall provide the functions necessary to automatically generate origin beams for the primary P wave steered to origins in the database.
P2SSS254:	The US NDC Training System shall provide the functions necessary to automatically generate origin beams for long-period phases for origins in the database.
P2SSS255:	The US NDC Training System shall provide functionality to configure all beam parameters.
P2SSS290:	The US NDC classified subsystem shall provide functions to write data to portable media readable by the US NDC Training System.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS291:	The US NDC Training System shall provide a GUI to monitor the status of processes for analysis data preparation.
P2SSS292:	The US NDC Training System shall provide a GUI to monitor the status of processes for student account management.
P2SSS293:	The US NDC Training System shall be designed to allow loading of alphanumeric data obtained from the US NDC in Oracle export format.
P2SSS294:	The US NDC Training System shall provide functionality to load waveform data from the US NDC available in Unix tar format.
P2SSS295:	The US NDC Training System shall provide functionality to read data from portable media prepared on the US NDC.
P2SSS296:	The US NDC Training System shall provide a GUI to form detection beams on array detections in a user-selected time interval.
P2SSS297:	The US NDC Training System shall provide a GUI to form origin beams on origins in a user-selected time interval.
P2SSS298:	The US NDC Training System shall provide a GUI to load waveform and alphanumeric data over a user-selected time interval.
P2SSS299:	The US NDC Training System shall provide a GUI to delete waveform and alphanumeric data over a user-selected time interval.
P2SSS300:	The US NDC Training System shall support sets of individual database accounts for twelve (12) students to allow each student to perform individual analysis for each of the following processing modes: global, hydro, spotlight and forward.
P2SSS301:	The US NDC Training System shall provide a GUI to create student database accounts.
P2SSS302:	The US NDC Training System shall provide a GUI to remove student database accounts.
P2SSS303:	The US NDC Training System student accounts shall have access to all data prepared by the instructor.
P2SSS338:	The US NDC Training System shall utilize hardware functionally compatible with the US NDC system.
P2SSS340:	The US NDC Training System shall provide a workstation for the instructor.
P2SSS341:	The US NDC Training System shall provide workstations to accommodate six (6) students.
P2SSS342:	The US NDC Training System shall provide functionality to produce high quality, black-and-white and color, hard copy reports and graphical output.
P2SSS343:	The US NDC Training System shall use interchangeable workstations and LRUs for items replicated in the training system.
P2SSS344:	The US NDC Training System shall provide functionality to perform an orderly startup and shutdown.
P2SSS345:	The US NDC Training System shall provide functionality to automatically shutdown prior to losing backup power from a UPS.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS366:	The US NDC Training System shall make waveform data on-line and accessible to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.
P2SSS368:	The US NDC Training System shall make alphanumeric data available to other processes with a latency (to first data accessed) of less than five seconds and with a sustainable transfer rate of greater than 500 kilobytes per second.
P2SSS369:	The US NDC Training System shall automatically backup all derived waveform and alphanumeric data once daily to offline storage.
P2SSS370:	The US NDC Training System shall restore data from an offline backup.
P2SSS371:	The US NDC Training System shall provide functionality to ensure data storage integrity of all data.
P2SSS378:	The US NDC Training System shall provide software required for database management of student accounts.
P2SSS379:	The US NDC Training System shall utilize software compatible with the US NDC.
P2SSS386:	The US NDC shall provide functionality to automatically monitor, collect, and report fault information.
P2SSS400:	The US NDC Training System shall support mission duration of 8 hours per day, 5 days per week, 250 days per year.
P2SSS401:	The US NDC Training System shall provide a minimum MTBCF of 1500 hours. A critical failure is defined as a failure that requires longer than 2 hours to repair.
P2SSS402:	The US NDC Training System shall provide an MTTR of less than 2 hours for 95% of repairs.
P2SSS403:	The US NDC Training System shall include the functionality to isolate all faults to one LRU using a combination of fault isolation and interactive troubleshooting procedures contained in system documentation.
P2SSS404:	The US NDC Training System shall support the use of an alternate storage device to allow for continued system operations in the event of a storage device failure.
P2SSS405:	The US NDC Training System shall be designed to enable LRU removal, replacement, and reinstallation within one hour.
P2SSS406:	The US NDC Training System data storage function shall be designed so that individual storage devices may be removed and replaced without loss of data or system integrity.
P2SSS407:	The US NDC Training System shall be designed for a two-level (organizational and depot) maintenance concept.
P2SSS408:	The US NDC Training System shall provide a minimum time between PMRs of 720 hours.
P2SSS409:	The US NDC Training System shall provide system documentation appropriate for the organizational and depot maintenance levels.
P2SSS413:	The US NDC Training System shall be equipped with an in-line uninterruptible power supply function that provided a minimum of 30 minutes of backup power.
P2SSS436:	The US NDC Training System shall operate at an acoustic noise level of less than 85 decibels.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS437:	The US NDC Training System shall acquire, process, and store data up to the DoD Secret level in accordance with CAP procedure established by the US Air Force for legacy based IS.
P2SSS442:	The US NDC Training System shall be composed of COTS hardware that does not require the use of toxic products or hazardous materials during normal operation or preventive maintenance tasks.
P2SSS443:	The US NDC Training System shall be composed of COTS hardware that does not contain volatile organic compounds (VOCs), or require the use of VOCs for normal operation or to perform preventive maintenance procedures.
P2SSS452:	The US NDC Training System shall provide hardware components specified to operate within the temperature range of 60 to 90 degrees Fahrenheit.
P2SSS453:	The US NDC Training System components shall be specified to operate within the relative humidity range of 20% to 80%, non-condensing.
P2SSS454:	The US NDC Training System hardware elements shall meet commercial standards for electrostatic discharge.
P2SSS455:	The US NDC Training System computer hardware shall comply with Part 15 of the Federal Communications Commission (FCC) rules for Class A or Class B digital devices.
P2SSS456:	The US NDC Training System shall be written in high order programming languages, minimizing the number of languages.
P2SSS457:	The US NDC Training System shall have software with a uniform and consistent user interface for access to all the interactive processing functionality within the Training System.
P2SSS458:	The US NDC Training System shall provide a COTS DBMS and a system infrastructure to manage databases such that data are continuously processed within the Training System without interruptions.
P2SSS459:	The US NDC Training System shall be designed to have its hardware and software incrementally upgraded over its operational lifetime, including the ability to add functionality, increase processing capacity, and increase memory storage capacity without unplanned loss of previous capabilities
P2SSS460:	The US NDC Training System shall provide on-line storage capacity for at least fifteen (15) 24 hour days of waveform data for all stations characterized in Table 1. Use of existing storage hardware and its capacity of 18GB per day is acceptable.
P2SSS461:	The US NDC Training System shall provide functionality to edit any measurement used for location, magnitude or discriminant analysis.
P2SSS462:	The US NDC Training System shall retain all original processing results when edited.
P2SSS463:	The US NDC Training System shall store the results of each analysis stage.
P2SSS464:	The US NDC Training System shall provide functionality to automatically perform event formation using user-selected detections.
P2SSS465:	The US NDC Training System shall provide interactive functionality to select those data that are defining for event magnitude.
P2SSS470:	The US NDC Training System shall provide the functionality to automatically generate event reports.

Table 6. Requirements Traceability (Continued)

SRD NO.	REQUIREMENT
P2SSS471:	The US NDC Training System shall provide the functionality to include in event reports the following event attributes: latitude, longitude, depth/elevation, time, magnitude, priority, discrimination data, waveform graphics, event summary text.
P2SSS472:	The US NDC Training System shall limit system access to specific authorized lists of users on specific authorized machines IAW the discretionary access procedures established in the CAP.
P2SSS474:	The US NDC Training System shall prevent the inadvertent disclosure of information to unauthorized users by protecting primary storage, fixed media, removable media, etc. IAW the object reuse requirements of the DAA approved Air Force Manual 33-229, 1 November 1997, CAP for IS systems.
P2SSS475:	The US NDC Training System shall comply with security standards IAW the CAP.
P2SSS476:	The US NDC Training System shall protect the integrity of data from unauthorized modification.
P2SSS477:	The US NDC Training System shall provide dependable audit capabilities that have the ability to selectively acquire and support tracing events to specific users.
P2SSS479:	The US NDC Training System shall require identification and authentication of all users attempting to log on to the system IAW the CAP for legacy systems.
P2SSS480:	The US NDC Training System shall provide warning banners advising users of system monitoring activities prior to completion of user login as part of the CAP auditing functionality.
P2SSS482:	The US NDC Training System shall make maximum use of COTS and Government off the Shelf (GOTS) software.
P2SSS486:	The US NDC Training System shall provide on-line storage capacity for at least 15 days of seismic and hydroacoustic alphanumeric data from the US NDC under nominal loading. Use of existing storage hardware and its capacity of 18GB per day is acceptable.
P2SSS519:	The US NDC Training System shall operate from an uninterruptible power supply (UPS) system to protect the COTS hardware from damaging voltage irregularities and power loss.
P2SSS520:	The US NDC Training System shall provide functionality to restart each workstation individually without affecting the operation of other workstations in the system.
P2SRD65:	N10.0.a The Alternate US NDC (ALT US NDC) subsystem shall provide a backup capability for the US NDC and shall perform all US NDC data acquisition and data processing.
P2SRD75:	N10.0.b The Alt US NDC shall ensure continuous 24-hour operations during times of evacuation of AFTAC during natural disasters. (Deferred)

Table 7. Higher-Level Traceability

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD1: N3.1.a The Phase 2 US NDC shall continue to meet all capabilities from the Phase 1 US NDC system.	P2SRD72	P2SSS29, P2SSS31, P2SSS41, P2SSS256, P2SSS257, P2SSS258, P2SSS259, P2SSS260, P2SSS261, P2SSS262, P2SSS263, P2SSS264, P2SSS265, P2SSS277, P2SSS278, P2SSS338, P2SSS340, P2SSS341, P2SSS342, P2SSS343, P2SSS344, P2SSS345, P2SSS347, P2SSS348, P2SSS352, P2SSS353, P2SSS354, P2SSS355, P2SSS360, P2SSS366, P2SSS368, P2SSS370, P2SSS378, P2SSS379, P2SSS451, P2SSS458, P2SSS460, P2SSS473, P2SSS518
P2SRD2: N3.1.b The US NDC shall consist of a distributed processing system made up of COTS-based equipment and connected through a local area network (LAN).	P2SRD66, P2SRD72	P2SSS337, P2SSS377, P2SSS380, P2SSS468
P2SRD3: N3.1.c The US NDC shall be partitioned into discrete subsystems: an Operational subsystem, a Development subsystem, a Sustainment subsystem LAN (which allows development and testing to continue simultaneously with system operation), a Training subsystem, and an alternate operational subsystem.	P2SRD72, P2SRD74	P2SSS380, P2SSS503, P2SSS504, P2SSS505, P2SSS506, P2SSS507
P2SRD4: N3.1.d The US NDC shall provide the capability to undergo a full development and operational test and evaluation on the Development subsystem with no impact to ongoing operations.	P2SRD68, P2SRD74	P2SSS380, P2SSS506
P2SRD5: N3.1.e The US NDC Development subsystem shall be fully functionally redundant with the Operational subsystem, with no shared components between subsystems except for data feeds and archives.	P2SRD74	P2SSS380, P2SSS508
P2SRD6: N3.2.a The US NDC shall automatically execute data acquisition, data processing, and data storage functions.	P2SRD66	P2SSS4, P2SSS5, P2SSS6, P2SSS7, P2SSS8, P2SSS9, P2SSS10, P2SSS375, P2SSS522

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD7: N3.2.b The US NDC shall provide manual execution capability for all automated data acquisition, data processing, and data storage functions.	P2SRD66, P2SRD72	P2SSS2, P2SSS3, P2SSS5, P2SSS6
P2SRD8: N3.3.a The US NDC shall use standard data input formats for waveform data.	P2SRD72	P2SSS11, P2SSS285, P2SSS286, P2SSS287, P2SSS288, P2SSS289, P2SSS310
P2SRD9: N3.3.b The US NDC shall have forward and backward compatibility with the standard waveform data.		P2SSS285, P2SSS286, P2SSS287, P2SSS288, P2SSS289
P2SRD10: N3.4.a The US NDC shall provide the capability to acquire authenticated data.		P2SSS13
P2SRD11: N3.5.a The US NDC shall support interfaces to the existing AFTAC Headquarters unclassified and classified broadband network for electronic mail, the transfer of data files and read-only access to the database, and exchange bulletin results.	P2SRD72	P2SSS266, P2SSS267, P2SSS268, P2SSS269, P2SSS270, P2SSS271, P2SSS273, P2SSS274, P2SSS275, P2SSS276, P2SSS283, P2SSS284, P2SSS499, P2SSS511
P2SRD12: N3.6.a The US NDC shall automatically acquire unprocessed seismic, hydroacoustic, infrasonic, and radionuclide sensor data.	P2SRD72	P2SSS12, P2SSS32, P2SSS33, P2SSS34, P2SSS35, P2SSS36, P2SSS37, P2SSS279, P2SSS280, P2SSS500
P2SRD13: N3.6.1.a The US NDC shall provide internal communication and data transfer protocols to ensure positive confirmation of 100% of data transfer and data integrity prior to deleting data from data buffers, including transfer of data from the unclassified to the classified subsystem and transfer of data between different storage media.	P2SRD72, P2SRD73	P2SSS40, P2SSS42, P2SSS43, P2SSS487, P2SSS509, P2SSS513, P2SSS532, P2SSS536
P2SRD14: N3.6.2.1 The US NDC shall integrate the capability, to be provided as GFE, to transmit calibration and control signals to all AFTAC-controlled sensor stations listed in the US NDC NDDOC.	P2SRD72	P2SSS14, P2SSS15, P2SSS16, P2SSS17, P2SSS18, P2SSS19, P2SSS20, P2SSS21, P2SSS22, P2SSS23, P2SSS24, P2SSS25, P2SSS26, P2SSS27, P2SSS28, P2SSS537

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD15: N3.7.a The US NDC shall automatically store all data processing results and associated data as soon as they are available.	P2SRD72	P2SSS95, P2SSS106, P2SSS107, P2SSS139, P2SSS140, P2SSS146, P2SSS158, P2SSS364
P2SRD16: N3.7.b The US NDC shall provide access to all data processing results, which have been committed to data, storage.	P2SRD72	P2SSS48, P2SSS52, P2SSS58, P2SSS66, P2SSS107, P2SSS139, P2SSS146, P2SSS157
P2SRD17: N3.7.c The US NDC shall automatically process all data from stations listed in the US NDC NDDOC.	P2SRD67, P2SRD71, P2SRD72	P2SSS44, P2SSS45, P2SSS46, P2SSS47, P2SSS49, P2SSS50, P2SSS51, P2SSS53, P2SSS54, P2SSS55, P2SSS56, P2SSS57, P2SSS59, P2SSS60, P2SSS61, P2SSS62, P2SSS63, P2SSS64, P2SSS65, P2SSS67, P2SSS68, P2SSS69, P2SSS70, P2SSS71, P2SSS72, P2SSS73, P2SSS74, P2SSS75, P2SSS76, P2SSS77, P2SSS78, P2SSS79, P2SSS80, P2SSS81, P2SSS82, P2SSS83, P2SSS84, P2SSS85, P2SSS86, P2SSS87, P2SSS88, P2SSS89, P2SSS90, P2SSS91, P2SSS92, P2SSS93, P2SSS94, P2SSS96, P2SSS97, P2SSS98, P2SSS99, P2SSS100, P2SSS101, P2SSS102, P2SSS103, P2SSS104, P2SSS105, P2SSS108, P2SSS109, P2SSS110, P2SSS111, P2SSS112, P2SSS113, P2SSS114, P2SSS115, P2SSS116, P2SSS117, P2SSS118, P2SSS119, P2SSS120, P2SSS121, P2SSS122, P2SSS123, P2SSS124, P2SSS125, P2SSS126, P2SSS127, P2SSS128, P2SSS129, P2SSS130, P2SSS131, P2SSS132, P2SSS133, P2SSS134, P2SSS135, P2SSS136, P2SSS137, P2SSS138, P2SSS141, P2SSS142, P2SSS143, P2SSS144, P2SSS145, P2SSS159, P2SSS160, P2SSS161, P2SSS188, P2SSS203, P2SSS204, P2SSS205, P2SSS206, P2SSS207, P2SSS208, P2SSS467, P2SSS484, P2SSS488, P2SSS489, P2SSS490, P2SSS514, P2SSS515, P2SSS516, P2SSS517, P2SSS534

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD18: N3.8.a The US NDC shall provide an interactive analysis capability to review, refine, correct, and/or display current results, regardless of whether they have been generated directly from the automated processing system or have been previously analyzed.	P2SRD67, P2SRD71, P2SRD72	P2SSS151, P2SSS152, P2SSS153, P2SSS154, P2SSS155, P2SSS156, P2SSS162, P2SSS163, P2SSS164, P2SSS165, P2SSS166, P2SSS167, P2SSS168, P2SSS169, P2SSS170, P2SSS171, P2SSS172, P2SSS173, P2SSS174, P2SSS175, P2SSS176, P2SSS177, P2SSS178, P2SSS179, P2SSS180, P2SSS181, P2SSS182, P2SSS183, P2SSS184, P2SSS185, P2SSS186, P2SSS187, P2SSS189, P2SSS190, P2SSS191, P2SSS192, P2SSS193, P2SSS194, P2SSS195, P2SSS203, P2SSS204, P2SSS205, P2SSS206, P2SSS207, P2SSS208, P2SSS211, P2SSS215, P2SSS216, P2SSS236, P2SSS237, P2SSS238, P2SSS411, P2SSS483, P2SSS485, P2SSS492
P2SRD19: N3.9.a The US NDC shall provide the capability to automatically generate reports for all events.		P2SSS203, P2SSS204, P2SSS205, P2SSS206, P2SSS207, P2SSS208
P2SRD20: N3.10.a The US NDC shall provide short-term (less than 45 days) on-line storage; long-term (45-180 days) near-line storage; and permanent (over 180 days) off-line storage of all data from the data origination date.	P2SRD72	P2SSS304, P2SSS305, P2SSS306, P2SSS307, P2SSS308, P2SSS309, P2SSS346, P2SSS349, P2SSS350, P2SSS351, P2SSS356, P2SSS357, P2SSS361, P2SSS362, P2SSS363, P2SSS364, P2SSS510, P2SSS535
P2SRD21: N3.10.b The US NDC shall provide a minimum of eight hours of unclassified and eight hours of classified buffer storage capability for all incoming data.	P2SRD72	P2SSS358, P2SSS359
P2SRD22: N3.11.a The US NDC shall provide the capability to automatically and interactively monitor data processing functions.	P2SRD72	P2SSS38, P2SSS39, P2SSS209, P2SSS210, P2SSS211, P2SSS214, P2SSS215, P2SSS216, P2SSS218, P2SSS219, P2SSS220, P2SSS221, P2SSS222, P2SSS223, P2SSS224, P2SSS225, P2SSS226, P2SSS227, P2SSS228, P2SSS229, P2SSS230, P2SSS231, P2SSS233, P2SSS234, P2SSS235, P2SSS236, P2SSS237, P2SSS238, P2SSS239, P2SSS240, P2SSS241

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD23: N3.11.b The US NDC shall provide the capability to automatically and manually generate performance monitoring reports.	P2SRD68	P2SSS212, P2SSS213, P2SSS217, P2SSS232
P2SRD24: N3.12.a The US NDC shall integrate the capability, to be provided as GFE, to use geographically referenced information required for data processing (e.g., political boundaries, areas of interest, regional seismic phase attenuation and blockage, sensor station locations, etc.).	P2SRD71, P2SRD72	P2SSS196, P2SSS197, P2SSS198, P2SSS199, P2SSS200, P2SSS201, P2SSS202
P2SRD25: N3.12.b The US NDC shall integrate software tools and functions, to be provided as GFE, which automatically and interactively access, spatially manipulate, and spatially process geographically referenced data.	P2SRD71	P2SSS196, P2SSS197, P2SSS198, P2SSS199, P2SSS201, P2SSS202
P2SRD26: N3.13.a The US NDC shall provide software tools to support tuning and evolution of geophysical performance.	P2SRD68	P2SSS147, P2SSS148, P2SSS149, P2SSS150
P2SRD27: N4.1.a The expected service life of all US NDC operational platform hardware components shall be five years from the conclusion of Phase 2 System Acceptance Testing.	P2SRD72	P2SSS376, P2SSS502
P2SRD28: N4.2.a The US NDC shall support a mission duration of 24 hours per day, 7 days per week, 365 days per year.	P2SRD72	P2SSS382

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD29: N4.3.a The US NDC shall provide a minimum operational availability of 99%. Operational availability is defined as MTBCF/(MTBCF + MRT). Mean Restoration Time (MRT) - the time to restore the subsystem to an operational condition after a critical failure and includes notification, response, supply, administration, and maintenance. Mean Time Between Critical Failures (MTBCF) - the time between critical failures. A critical failure implies that a portion of the US NDC hardware and/or software is unable to collect or process required data. Any of the following conditions constitutes a US NDC critical system failure: The inability of the US NDC to continuously process data from any sensor station identified as essential to monitoring within one hour of data acquisition at the station. The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 98% data accuracy and within 15 minutes of data acquisition at the station. The inability of the US NDC to continuously acquire and forward to the IDC data from US territorial stations identified in the CTBT with 97% data timeliness and within five minutes of data acquisition at the station. The inability of the US NDC spotlight and forward processing pipelines to identify and report an explosion within one hour of data acquisition at the station.	P2SRD72	P2SSS395, P2SSS399
P2SRD30: N4.3.b The US NDC shall provide a minimum MTBCF of 2160 hours (90 days).	P2SRD72	P2SSS381
P2SRD31: N4.3.c The US NDC shall provide an MRT of 21.8 hours.	P2SRD72	P2SSS383
P2SRD32: N4.3.d No repair action mitigating a US NDC critical failure shall exceed four hours.	P2SRD72	P2SSS397

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD33: N4.3.e The US NDC shall be designed to ensure 95% of repairs are made in less than two hours.	P2SRD72	P2SSS384
P2SRD34: N4.4.a The US NDC shall be designed for a two-level maintenance concept.	P2SRD72	P2SSS385
P2SRD35: N4.4.b The US NDC shall exhibit a minimum time between preventative maintenance routines (PMRs) of 720 hours.	P2SRD72	P2SSS387
P2SRD36: N4.4.c No US NDC PMR shall require a system outage such that a critical failure situation (as defined in requirement N4.3.a) occurs.	P2SRD72	P2SSS388
P2SRD37: N4.5.a All US NDC critical failures (as defined in paragraph N4.3.a) shall be automatically detected and reported.	P2SRD72	P2SSS386, P2SSS393
P2SRD38: N4.5.b All detected faults shall be isolated to one LRU using a combination of automatic fault isolation and manual troubleshooting procedures contained in the system technical documentation.	P2SRD72	P2SSS389, P2SSS393
P2SRD39: N4.5.c The US NDC shall detect and report the loss of a storage device.	P2SRD66	P2SSS386, P2SSS390, P2SSS391, P2SSS393
P2SRD40: N4.5.d The US NDC shall automatically switch to an alternate storage device to allow for continued system operations in the event of a storage device failure.	P2SRD72	P2SSS391, P2SSS521
P2SRD41: N4.5.e The US NDC shall provide a graphical display of US NDC system status by monitoring and reporting the health of US NDC critical hardware and software components in a real-time environment.	P2SRD66	P2SSS386
P2SRD42: N4.5.f The US NDC shall allow for data recovery in the event of storage device failure.	P2SRD72	P2SSS392

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD43: N4.6.a The US NDC shall be designed to enable LRU removal, replacement, and reinstallation within one hour without loss of data or system integrity.	P2SRD72	P2SSS394, P2SSS396
P2SRD44: N4.7.a The US NDC shall provide the capability to automatically monitor, collect, and report fault information.	P2SRD66	P2SSS386, P2SSS389
P2SRD45: N4.8.a The US NDC shall maximize the use of interchangeable workstations, LRUs, and circuit card assemblies (CCAs).	P2SRD72	P2SSS398
P2SRD46: N4.9.a The US NDC shall operate at a noise level in accordance with the Occupational Safety and Health Administration (OSHA) guidelines for an office environment.	P2SRD72	P2SSS332
P2SRD47: N5.1.a The US NDC shall acquire, process, and store data up to the DoD SECRET level.	P2SRD72	P2SSS313
P2SRD48: N5.1.b The US NDC shall have the mechanisms to protect itself from external access by unauthorized personnel.	P2SRD72	P2SSS314
P2SRD49: N5.1.c The US NDC shall limit external access to selected portions of the system to authorized users.	P2SRD72	P2SSS315, P2SSS320, P2SSS321
P2SRD50: N5.1.d The US NDC shall provide security measures to protect against inadvertent or deliberate release of classified data to unauthorized personnel.	P2SRD72	P2SSS316
P2SRD51: N5.2.a The US NDC architecture shall comply with all security standards levied down by appropriate DAA.	P2SRD72	P2SSS317, P2SSS318, P2SSS319, P2SSS322, P2SSS323, P2SSS324, P2SSS325, P2SSS326

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD52: N6.1.a The US NDC system shall be capable of operating in a normal office environment with local power, 110-120/220-240 volts AC, 60 Hz, single phase, and shall be robust enough to handle voltage irregularities and power loss without damaging the system and/or losing stored data.	P2SRD72	P2SSS327, P2SSS328, P2SSS519
P2SRD53: N6.1.b The US NDC shall be capable of sustained operation over the temperature range of 60-90° F.	P2SRD72	P2SSS329
P2SRD54: N6.1.c The US NDC shall be capable of sustained operation over the relative humidity range of 20-80%.	P2SRD72	P2SSS330
P2SRD55: N6.1.1.a The US NDC shall have the capability to perform an orderly shutdown when notified of an imminent power loss and/or if the operating temperature exceeds 90° F.	P2SRD72	P2SSS333, P2SSS334
P2SRD56: N6.2.a The computer hardware elements of the US NDC system shall meet commercial standards and shall not fail due to electrostatic discharges produced by proper handling, operation, and maintenance of the system.	P2SRD72	P2SSS335
P2SRD57: N6.3.a The US NDC computer hardware shall comply with Part 15 of Federal Communications Commission (FCC) rules for Class A digital devices.	P2SRD72	P2SSS332, P2SSS336
P2SRD58: N6.4.a The US NDC shall comply with the requirements of applicable regulations promulgated by federal regulatory agencies governing toxic products and hazardous materials.	P2SRD72	P2SSS311
P2SRD59: N6.5.a The US NDC shall not include, or require the use of, volatile organic compounds restricted by regional air quality regulations.	P2SRD72	P2SSS312

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD60: N6.6.a The US NDC shall be designed to support introduction of upgraded software/hardware, functionality, and additional processing capacity without unplanned loss of previous capabilities.	P2SRD69	P2SSS410
P2SRD61: N7.0.a The US NDC software shall be written in high order programming languages, minimizing the number of languages.	P2SRD72	P2SSS372
P2SRD62: N7.0.b The US NDC shall make maximum use of commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) software.	P2SRD69, P2SRD72	P2SSS373, P2SSS375, P2SSS493, P2SSS495, P2SSS496, P2SSS497, P2SSS498, P2SSS526, P2SSS527, P2SSS528, P2SSS529, P2SSS530, P2SSS531
P2SRD63: N8.0.a The US NDC software shall have a uniform and consistent user interface for access to all the processing capability within the US NDC.	P2SRD72	P2SSS374

Table 7. Higher-Level Traceability (Continued)

SRD REQUIREMENTS	APPENDIX C HIGHER-LEVEL REQUIREMENTS	SSS SPECIFICATIONS
P2SRD64: N9.0.a The US NDC Training Subsystem shall reliably simulate US NDC operations, and support the school's effort to provide personnel capable of performing to AFTAC standards in this critical environment.	P2SRD70, P2SRD72	P2SSS242, P2SSS243, P2SSS244, P2SSS245, P2SSS246, P2SSS247, P2SSS248, P2SSS249, P2SSS250, P2SSS251, P2SSS252, P2SSS253, P2SSS254, P2SSS255, P2SSS290, P2SSS291, P2SSS292, P2SSS293, P2SSS294, P2SSS295, P2SSS296, P2SSS297, P2SSS298, P2SSS299, P2SSS300, P2SSS301, P2SSS302, P2SSS303, P2SSS338, P2SSS340, P2SSS341, P2SSS342, P2SSS343, P2SSS344, P2SSS345, P2SSS366, P2SSS368, P2SSS369, P2SSS370, P2SSS371, P2SSS378, P2SSS379, P2SSS386, P2SSS400, P2SSS401, P2SSS402, P2SSS403, P2SSS404, P2SSS405, P2SSS406, P2SSS407, P2SSS408, P2SSS409, P2SSS413, P2SSS436, P2SSS437, P2SSS442, P2SSS443, P2SSS452, P2SSS453, P2SSS454, P2SSS455, P2SSS456, P2SSS457, P2SSS458, P2SSS459, P2SSS460, P2SSS461, P2SSS462, P2SSS463, P2SSS464, P2SSS465, P2SSS470, P2SSS471, P2SSS472, P2SSS474, P2SSS475, P2SSS476, P2SSS477, P2SSS479, P2SSS480, P2SSS482, P2SSS486, P2SSS519, P2SSS520
P2SRD65: N10.0.a The Alternate US NDC (ALT US NDC) subsystem shall provide a backup capability for the US NDC and shall perform all US NDC data acquisition and data processing.		
P2SRD75: N10.0.b The Alt US NDC shall ensure continuous 24-hour operations during times of evacuation of AFTAC during natural disasters. (Deferred)		

6. Notes

6.1 GFE Products

Sections 3.2.2.2, 3.2.2.3 and 3.2.2.4 of this document include numerous specifications related to GFE products that the Phase 2 US NDC is expected to incorporate. These products, which include McTool, DCCLite, Ancillary Data, and OMS software, are associated with station monitoring, calibration and control, and ancillary data acquisition. In order to meet the requirements that apply to these sections, the US NDC development team must receive these GFE items prior to the US NDC Phase 2 Build 1 CDR.

Appendix A. Acronyms and Definitions

A	Analysis
ac, AC	Alternating current
ADSN	AFTAC Distributed Subsurface Network
AFTAC	Air Force Technical Applications Center
AOI	Area of Interest
ASN	AFTAC Southern Network
CAP	Controlled Access Protection
CDR	Critical Design Review
COTS	Commercial Off-the-Shelf
CSS	Center for Seismic Studies
CTBT	Comprehensive Test Ban Treaty
D	Demonstration
DAA	Designated Approval Authority
DAM	Data Acquisition Manager
DBMS	Database Management System
DID	Data Item Description
DLT	Digital Linear Tape
DoD	Department of Defense
DoE	Department of Energy
DTC	Data Transaction Center
EDP	Event-Driven Processing
FCC	Federal Communications Commission
FK	Frequency-wave number
FL	Florida
FTP	File Transfer Protocol
GAFB	Goodfellow Air Force Base
GFE	Government Furnished Equipment
GIS	Geographical Information System
GOTS	Government Off-the-Shelf
GUI	Graphical User Interface
I	Inspection

IAW	In accordance with
ICD	Interface Control Document
IDC	International Data Centre
ILSP	Integrated Logistics Support Plan
IMS	International Monitoring System
IRS	Interface Requirements Specification
IS	Information Security
LAN	Local Area Network
LANL	Los Alamos National Laboratory
LRU	Line Replaceable Unit
MCH	Mission Critical Hardware
MRT	Mean Restoral Time
MTBCF	Mean Time Between Critical Failures
MTTR	Mean Time to Repair
NDDOC	Network Definition Document
NFS	Network File System
NTP	Network Time Protocol
OMS	Operations and Maintenance Subsystem
OPS	Operations
PAFB	Patrick Air Force Base
PDD	Presidential Decision Directive
PMR	Preventive Maintenance Routine
PPL	Program Parts List
SAT	System Acceptance Testing
SMTP	Simple Mail Transfer Protocol
SOM	Seismic Operations Manager
SOW	Statement of Work
SPOPS	Special Operations
SRD	System Requirements Document
SSS	System Subsystem Specification
SUDS	Seismic Unified Data System
T	Test
TCP/IP	Transmission Control Protocol/Internet Protocol

TI	Technical Instruction
TX	Texas
UPS	Uninterruptible Power Supply
US	United States
US NDC	United States National Data Center
US AEDS	United States Atomic Energy Detection System
USGS	United States Geological Survey
VOC	Volatile Organic Compound
WAN	Wide Area Network